Abbreviations

BA	Breathing apparatus
BR	British Rail
BRS	British Road Services
CPL Regulations	Classification, Packaging and Labelling of Dangerous Substances Regulations 1984
EHO	Environmental Health Officer
EMA	Employment Medical Adviser (HSE)
EMAS	Employment Medical Advisory Service (HSE)
FBU	Fire Brigades' Union
FSMA	Fire Service Medical Adviser
HSE	Health and Safety Executive
HSW Act	Health and Safety at Work etc Act 1974
NCL	National Carriers Ltd
NFC	National Freight Consortium plc
Pickfords	Pickfords Removals Ltd

Cover photograph: *South Yorkshire Constabulary*

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Health and Safety Executive

The Brightside Lane Warehouse Fire

A report of the investigation by the Health and Safety Executive into the effects of the fire at the National Freight Consortium warehouse building, Brightside Lane, Sheffield, on 14 December 1984.

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Summary

On 14 December 1984 fire broke out in a furniture repository in Sheffield which formed part of a very large warehouse and transit shed building occupied by the National Freight Consortium plc. In two days the fire destroyed the whole warehouse, with the exception of one protected section. It involved the attendance of several hundred firemen over a total period of six days. Among the wide variety of goods stored in the building was a relatively small tonnage of chemicals. Concern was expressed during and after the fire about the difficulty experienced by the Fire Brigade in identifying the possible risks from the materials stored, followed by allegations by the Fire Brigades' Union that firemen had been unnecessarily exposed to harmful fumes without the benefit of breathing apparatus. The fire also led to expressions of concern about a number of aspects, including the delay in summoning the Fire Brigade and possible exposure of members of the public to harmful fumes and asbestos material evolved in the fire.

The Health and Safety Executive examined the construction of the building, its occupational use, the nature and location of the materials stored and the toxic properties of the products of their combustion, the likely causes and origin of the fire, the fire fighting operation so far as it had a bearing on the safety of the men concerned, and the consequences of the fire.

The investigation showed that the fire started in an unattended warehouseman's cabin in Pickfords' furniture repository and that the cause was probably associated with the use of an old fireclay panel heater. In the absence of automatic fire detection equipment the fire was burning for at least 30 minutes before it was discovered and the Fire Brigade called.

The structure of the building permitted the fire to spread very rapidly, so presenting the Fire Service with problems compounded by difficulties with water supplies, access and information. The investigation confirmed that there was a lack of control and communication at critical points, affecting compliance with the procedures for using breathing apparatus, and some failure also to react with due care for safety during fire fighting. As a consequence, firemen were exposed to unnecessary risks. At present it does not appear that asbestos fragments or smoke produced by the fire will affect the long term health of the community.

The report makes a series of recommendations and suggestions which could contribute to higher standards of safety in future. They include:

South Yorkshire County Fire Service to

ensure that necessary practical improvements are made with regard to protection of the health and safety of firemen (paragraphs 216 and 217) and

review priorities for planning inspections under the Fire Services Act 1947 (paragraph 215).

The Home Departments to

continue to take account of health and safety legislation and its application to local authority fire services in striking a balance between operational needs in fire fighting and protection of the health and safety of firemen (paragraphs 216 and 217),

consider whether any lessons learned from the experience at Brightside Lane should be disseminated to other fire authorities (paragraph 217) and

review their guidance on medical standards for the fire services, and their application (paragraphs 218 and 219).

The Department of the Environment to

consider amending the Building Regulations and advising on measures to reduce the risk of fire spread in large single storey buildings (paragraph 212).

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National Freight Consortium plc to

monitor effectively compliance with relevant legislation by companies occupying its premises (paragraphs 204 and 205).

National Freight Consortium and other owners or occupiers of similar large buildings to

minimise the risk of a fire remaining undetected or spreading rapidly by such means as

(a) installing automatic smoke or fire detection systems, preferably linked to fire stations (paragraphs 206 and 207),

(b) partitioning large buildings into fire resisting compartments (paragraphs 208 and 209),

(c) providing adequate fire vents in roofs (paragraphs 210 and 211),

(d) obtaining appropriate information about potentially hazardous materials and making this information and details of location readily available for emergency services (paragraphs 213 and 214) and

(e) ensuring that private fire fighting water supplies are checked (paragraphs 213 and 214).

British Standards Institution to

review the test procedures for roofing materials in BS 476 (paragraphs 210 and 211).

Introduction

1 Just after noon on Friday 14 December 1984 a fire started in a massive warehouse complex to the east of Sheffield city centre. It developed into the biggest fire in the history of the South Yorkshire County Fire Service and caused about £20 million damage. Nevertheless there were no immediate injuries to employees, nor was there any significant risk to the general public although the fallout of charred asbestos paper-like fragments caused some alarm.

2 Public concern gathered impetus some four weeks later, when wide publicity was given to the Fire Brigades' Union (FBU) complaints about the protection of their members' health. In March 1985 this resulted in an undertaking by the Parliamentary Under-Secretary of State that a thorough-going investigation of the fire would be made. Accordingly the Health and Safety Executive (HSE) continued and broadened its enquiries, in cooperation with the Police, local authorities, the FBU and the South Yorkshire County Fire Service.

3 Starting as it did, some time after the event, the investigation had to rely heavily on the recollection of individuals, supplemented by the records, photographs and films made at the time or shortly afterwards. Although it was not possible to interview everyone involved, this report presents as complete a picture as possible. The report sets out the factual background, and describes the fire and its effects; it examines the issues raised, and draws conclusions about the lessons to be learned and makes recommendations on them.

4 Estimation of the toxic properties of the smoke plume evolved in the fire and the characteristics of the bituminous asbestos-coated steel sheeting which played a part in the spread of the fire are the subject of research projects by the Fire Research Station and HSE's Research and Laboratory Services Division. This work continues and it is expected that publication of these results will follow.

The situation

The site

5 The site is a British Rail (BR) marshalling yard and freight terminal in the industrial east end of Sheffield, bounded on the north side by railway lines carrying high speed passenger trains and goods trains using the marshalling yard. On the south side there are sidings between the building and the Brightside Lane boundary. At the north eastern (Upwell Street) end of the site there is a garage area with fuel pumps and a building used both by the Police as a training school and by the National Freight Consortium plc (NFC) companies and BR for administration and maintenance purposes (see Figure 1 for site details).

The building

6 The extensive building (Figure 2) covered 3.5 hectares, was roughly rectangular in plan and measured approximately 323m by 120m and was 7.5m high to the eaves. Built in 1964 for BR Small Parcels Division, it was divided into a warehouse and a transit shed served by railway lines from the marshalling yard. The transit shed measured approximately 280m by 74m and the warehouse 300m by 47m. The building's main axis lay roughly north east/south west, with the transit shed to the north.

7 Both parts of the building were steel framed structures formed with heavy portal frames at 6.1m centres. Where the two parts of the building adjoined for 256m of their length they shared a common grid and intermediate columns. The roof of both parts was formed in two spans, measuring 35.4m and 38.4m wide

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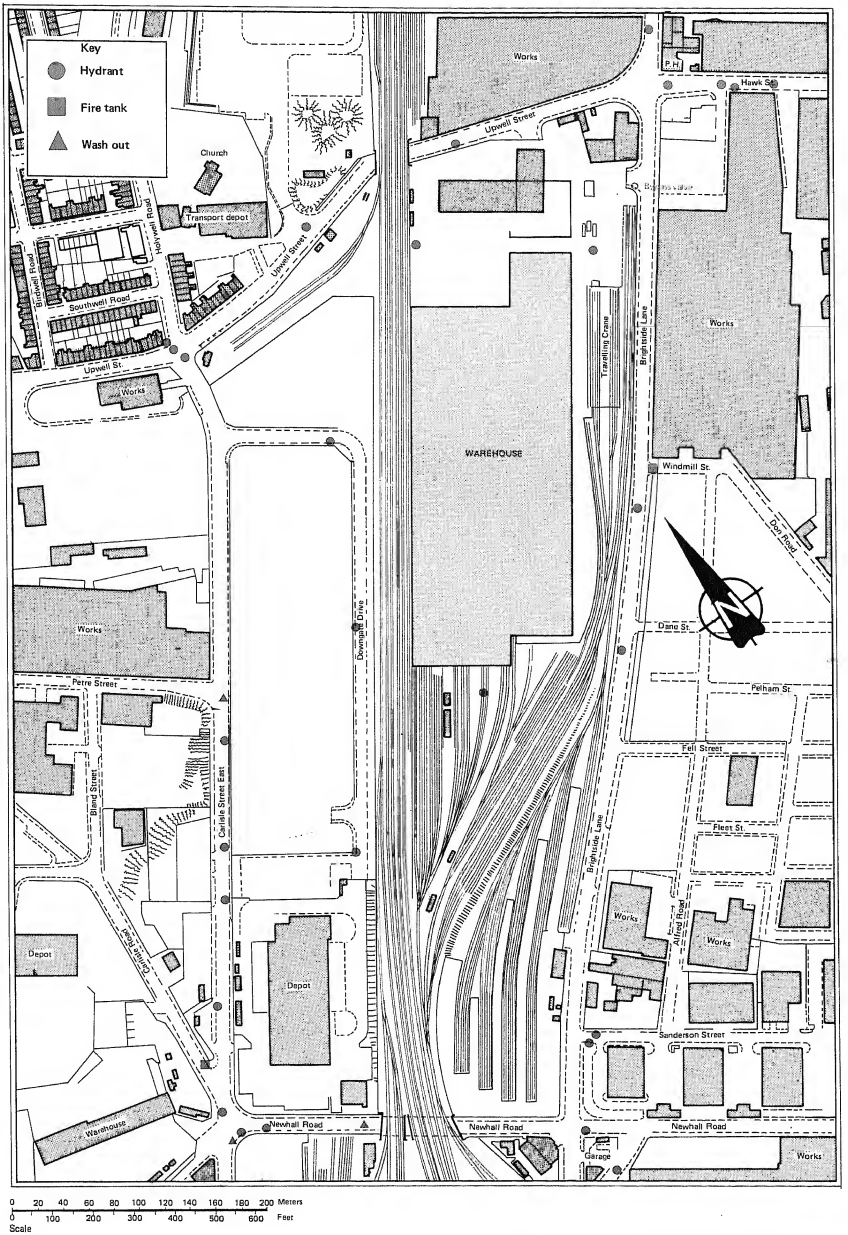

Fig 1 Plan of surrounding area

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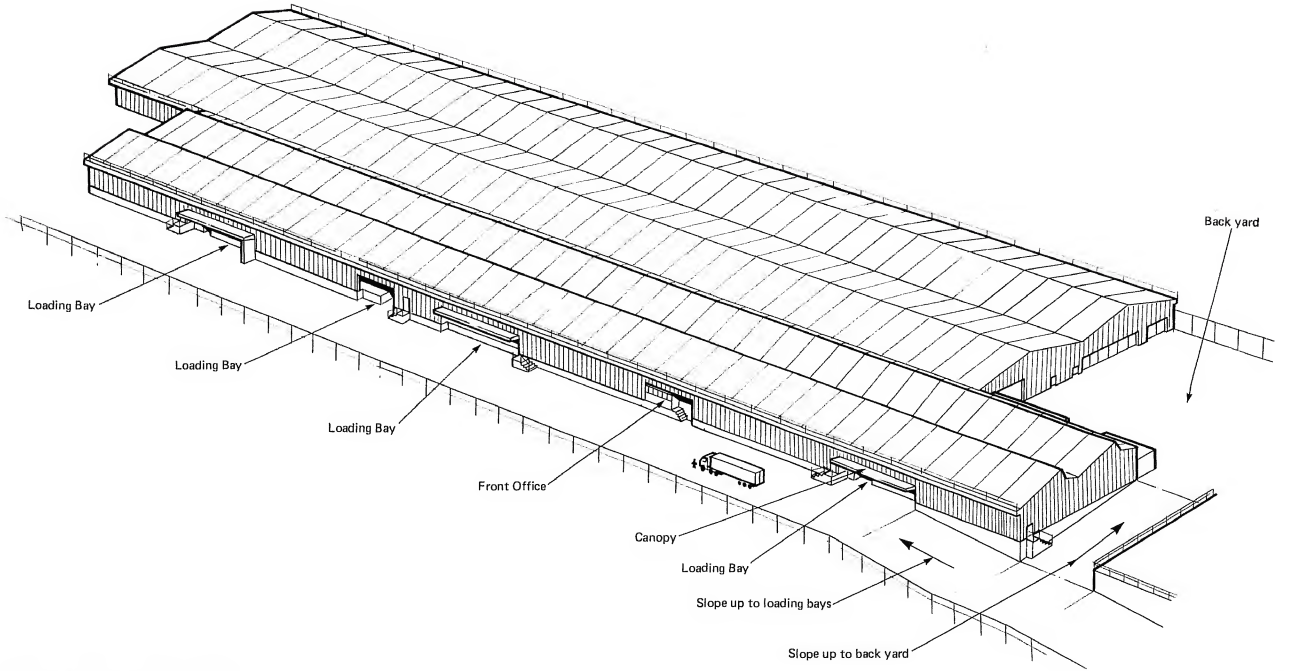

Fig 2 Artist's impression of warehouse

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in the transit shed with equal spans of 23.4m in the warehouse.

8 The warehouse roof was of north light construction, with a framework attached to the apex and the northern slope of the portal spans to support the vertical, wired glazing. Set into the roof slope below the north light was a two-purlin deep strip of translucent glassfibre-reinforced polyester panels alternating with plastic-coated steel sheeting. The steel sheets of the warehouse roof were underdrawn with dense asbestos board suspended several inches below the outer skin, with an uninterrupted air space running the length of the building.

9 Initially there were few partitions within the building. The transit shed and warehouse were separated by a wall consisting of coated, profiled steel sheets lined on the warehouse side with Asbestolux sheets. The warehouse area was divided into four large sections. Originally it had been divided by the erection of a 342 mm thick brick wall, giving an area of some 3150 m^2 at the south western end (Unit 4 – Figure 3) and 10 900 m^2 to the north eastern end. This brick wall, built up to the underdrawing, returned to the south west along the division between the warehouse and the transit shed. The present owners, NFC, had subdivided the larger area into three (Units 1, 2 and 3) by the erection of profiled steel sheet partitions extending to the underside of the underdrawn ceiling panels.

10 The transit shed was undivided until 1983 when an area approximately 1200 m^2 at the north east corner was partitioned off as a heavy vehicle workshop with associated offices (Unit 6). This partition was constructed to a two-hour fire resistance standard.

11 Activity in the transit shed centred largely on the one track remaining in use out of the 13 which originally ran into the building ("road" number 11, Figure 3). Most of the other tracks had been concreted over and the rail entrances into the transit shed closed off except for three tracks. The development of Unit 6 had necessitated removal of the ramp giving vehicular access to the L-shaped raised platform. Consequently goods were transferred to this platform from the central floor area by means of fork lift trucks.

12 Apart from the corrugated asbestos cement sheets on the north western elevation, the cladding of the roof and sides was "Cellactite" a proprietary corrugated steel sheet coated on both sides with a compressed layer of mixed bitumen and asbestos. Additionally, the cavity of the warehouse walls was filled with mineral fibre to provide thermal insulation.

13 The roof of the building had no fire ventilators, although the glass-reinforced polyester roof lights would burn or melt rapidly to provide a degree of ventilation for smoke and gases.

14 In the transit shed no fire protection was provided for the structural steel frame, wall or roof cladding. The warehouse was lined internally with dense asbestos insulating board to the side cladding and soffit. The columns were encased in 50 mm of concrete and the rafters coated with Limpet sprayed asbestos to give two-hour fire resistance.

15 Comprehensive electric fire alarm and hose-reel fire fighting systems had been installed during construction of the building. There was no automatic fire detection or sprinkler system. A four inch diameter water main had been laid around the building, with a series of fire hydrants. A valve was fitted at the main entrance to the site specifically to allow the Fire Service to bypass the meter and so obtain full mains pressure.

Management control and occupation

16 The building is owned by NFC whose subsidiary companies include British Road Services Ltd (BRS), National Carriers Parcels Service, GDS Transport and Pickfords Removals Ltd, all of which occupied units on the Brightside Lane site, each with their own separate management. The Property Group of the Consortium, formed about 1982 when the companies were denationalised, provided and maintained the premises.

17 Given the wide variety of materials stored,the safe conduct of warehousing depends not so much on detailed regulatory control and supervision as on a proper system for the storage and handling of goods by adequately trained and experienced employees under the supervision of a responsible, informed management.

18 This was essentially how the business operated at Brightside Lane. The controlling managers were long-serving employees with knowledge and experience of the BR Board rule book for the identification and marking of hazardous substances. The principles of the company safety policy issued originally by NCL were carried on after the recent changes of occupation. Regular meetings were held between management and staff on the site, including appointed safety representatives, for the exchange of information affecting safety and health. First aid and fire fighting arrangements were well known and practised. Protective clothing was provided and worn during the handling of dangerous chemicals. Foodstuffs were stored remote from chemicals of any description. The flammable characteristics of new goods, such as the recently stored polypropylene granules, were established before the goods were brought into store.

19 Standard warehousing conditions were applied on the site by the companies to enable them to refuse to accept goods for warehousing and to require customers to supply advance information about dangerous goods before acceptance.

20 Comprehensive guidance on safe warehousing of substances with hazardous characteristics is available in

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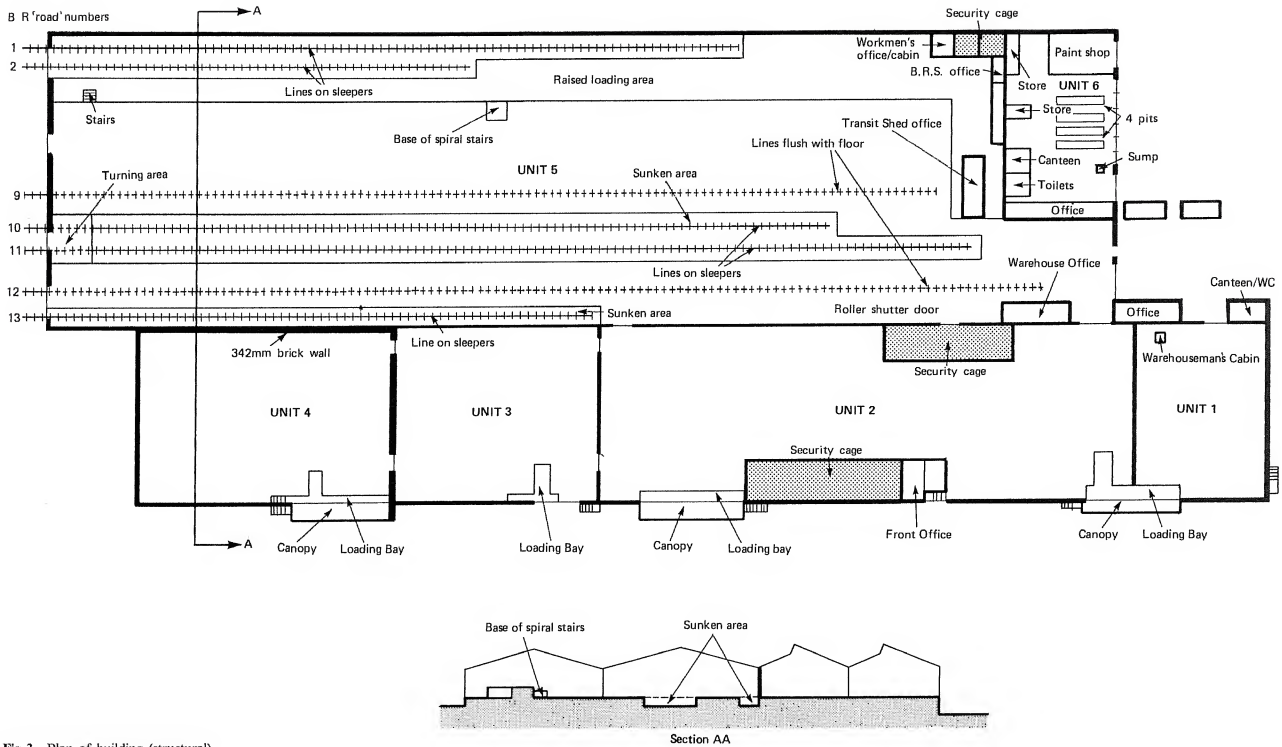

Fig 3 Plan of building (structural)

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a booklet recently issued by the Chemical Industries Association in cooperation with the Warehousing, Ports and Road Haulage Associations. It sets out factors to be considered and key responsibilities and gives guidance on appreciation of product hazards and segregation of goods, drawing attention to the effects on the environment and locality which can result from a disastrous fire. It also considers factors which should be taken into account in the design and construction of warehouse buildings, complementary to those imposed by the Building Regulations. It suggests security measures, a safety management system and operating procedures and gives an outline guide for employee training and emergency procedures.

21 While the Brightside Lane management were not consciously following this guidance, the procedures for storing goods were essentially similar to those recommended, with the exception of the storage of chemicals; segregation of certain chemicals, and isolation from the remainder of the warehouse, would have been necessary to meet current standards.

22 It was fortuitous that more chemicals were not in the warehouse at the time and that those that were there did not become seriously involved in the conflagration: for example, combustion of fluorides which were present would have added substantially to the toxic properties of the gases in the smoke plume, with increasing risk to anyone affected by the smoke.

23 However the thousands of tons of cardboard, wood, plastics (in the form of containers, cable, conveyor belting, pipes or granules) and normally innocuous material such as the animal feedstuff additives in store were all capable of giving off toxic gases when burnt or exposed to high temperatures, as are many ordinary materials. When the products of combustion are trapped within a building the effects on the health of those exposed can be damaging, sometimes insidiously. This is well understood by fire authorities, but must be stated because allegations of unnecessary exposure of firemen to smoke at Brightside Lane were largely responsible for HSE's comprehensive investigation of the fire.

24 Further guidance on safe warehousing is to be issued shortly by HSE in the form of a guidance note, which is in course of preparation.

25 The occupation of each unit is described below and such details of goods stored as could be determined in retrospect are indicated in Appendix 1.

26 *Unit 1* Area 1670 m^2: occupied by Pickfords as a furniture and household goods store. At the time of the fire it contained 608 standard pallets — wooden boxes 2.1 m^3 — stacked mostly three high. There was a stack of rolled carpets, miscellaneous part loads, archives (documents in cabinets) and some large items of polyurethane foam-filled furniture stacked in the north west corner of the store (Appendix 2). Access to the storage area was restricted to Pickfords' employees and there was a strict rule against smoking. The warehouseman was a non-smoker.

27 Within the storage area there was a warehouseman's cabin made from a converted pallet of which half of one side had been cut and hinged to form a door. This cabin had been furnished with a timber desk, a chair, a stool, an electric heater and a lampholder with a bare lamp bulb.

28 The administrative offices for the store were in a Portakabin building against the brick outside wall of the unit. There was no communication, either direct or visual, between these offices and the furniture storage area.

29 *Unit 2* Area 6600 m^2: occupied by NCL for general warehousing. NCL kept records of goods brought in and taken out; there was no restriction placed on the nature of those goods provided the packaging was suitable for stacking. The widely varying goods, including cardboard cartons, foodstuffs, electrical equipment, timber and plastic items, nickel and polypropylene granules, were stacked around the walls and in the central area, with 16 foot wide gangways for the movement of the fork-lift trucks used by NCL employees. The manager of this unit had taken over responsibility for the NCL-controlled operations only months before the fire, in which time warehousing turnover had significantly increased and storage of plastic granules in large quantity had started.

30 The records of goods stored were kept in filing cabinets in a mobile Portakabin office inside the transit shed near the roller shuttered entrance to Unit 2 (see Figure 3). This office had been established only a short time before the fire, having previously been located in a permanent brick-built office on the Brightside Lane side of the warehouse. Both the old and new offices and their contents survived the fire intact apart from minor water damage.

31 *Unit 3* 2600 m^2: occupied by BRS and containing tyres, plastics, metals, paper and cardboard, timber, wine and household cleaners such as bleach and washing powder. Although customers had access to their goods within the warehouse, handling was wholly performed by BRS employees.

32 *Unit 4* 3000 m^2: occupied by GDS for the storage of manufacturers' goods pending distribution to their retail outlets.

33 *Unit 5* 18020 m^2: occupied by NCL to hold goods for short periods while in transit, although there were areas where longer-term storage was permitted.

34 Rail wagons were despatched once a day to Birmingham, Warrington, Gateshead, Peterborough and Bradford. Road vehicles made deliveries and collections in South Yorkshire, West Riding, Humberside, Lincolnshire, Nottinghamshire and Derbyshire.

35 The office where the daily transit movement records were kept was situated on the raised platform area

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(Figure 3). These records consisted of manifest sheets, which summarised each consignment note for goods in transit. The consignment note identified the sender, the consignee, the number of packages, the weight and description of the goods, any particular marking including hazard labels and a serial number. A reference copy of each manifest was retained by NCL in the transit shed office until the goods were checked and placed on the appropriate module for delivery or further transhipment. Since the turnover of goods was so rapid and the contents of the tautliners — flat trailers with curtain sides and a top — were not known before their arrival, and, in some cases, never known, the transit shed office played a key role in supplying information about the goods in the building at any one time.

36 Since all the manifests were destroyed in the fire the record of goods in the transit shed on 14 December is not available, but there were certainly plastics, polypropylene granules, acetylene cylinders, metal goods and refractory materials. Approximately 70 tonnes of chemicals including sodium nitrite and fluorides were kept here, the records for which were in the warehouse office. The chemicals were stored on pallets in an area to the north west of the central roadway for about 15 m inside the main entrance from the yard. There was no significant separation of the various stacks, nor was the area cut off from general circulation; however there was little risk of accidental impact by passing traffic.

37 *Unit 6* 1210 m^2: occupied by BRS as a heavy vehicle maintenance workshop, with a mezzanine office block contained within the two-hour fire resisting walls separating this unit from Unit 5. This factory unit had a series of up-and-over doors in the outer wall at the approaches to inspection pits set in the floor.

Relevant legislation and its enforcement

38 British Rail, the original developers, were not obliged to comply with the requirements of the Building Regulations. Nevertheless it was their policy to do so and, in the opinion of the Principal Building Surveyor of the Sheffield City Council, the requirements of the Building Regulations at the time would have been satisfied. The main purpose of these Regulations is to protect the health and safety of people in or about buildings: they are not concerned with the protection of property. They are supplemented by local legislation, in this case the South Yorkshire Act 1980, Section 55 of which requires the provision of adequate means of access for fire brigades; this did not apply to the Brightside Lane complex which had been constructed earlier.

39 All activities on the site were subject to the Health and Safety at Work etc Act 1974 (HSW Act). The warehouse building and much of the transit shed constituted a warehouse within the meaning of Section 125 of the Factories Act 1961. The applicable requirements of that Act do not include any duty to notify to the enforcing authority (HSE) the existence, or changes in occupation, of a warehouse. The BRS vehicle workshop (Unit 6) was a factory; notice of occupation had been submitted to HSE in 1983 in accordance with Section 137.

40 Certain offices on the site were subject to the Offices Shops and Railway Premises Act 1963 which requires notification of occupation (in this case to HSE) when office work totals more than 21 hours a week. Pickfords had not notified HSE of the occupation of their office in Unit 1 in 1983. Had HSE received notification a factory inspector would have visited before the fire and looked at the furniture storage area, which was a warehouse within the meaning of Section 125 of the Factories Act and had not been inspected previously.

41 Those parts of the premises subject to the Factories Act were also subject to the Electricity (Factories Act) Special Regulations 1908 and 1944. The Highly Flammable Liquids and Liquefied Petroleum Gases Regulations 1972 applied to the storage and use of paints and thinners in the BRS vehicle workshop (Unit 6). None of the goods held in the premises was notifiable under the Notification of Installations Handling Hazardous Substances Regulations 1982 nor under the Control of Industrial Major Accident Hazards Regulations 1984.

42 The Fire Precautions Act 1971 applied to the premises but, apart from Unit 6 occupied by BRS and the offices, they were not premises "designated" under Section 1(2) of the Act. A fire certificate was required for Unit 6 and was in preparation by South Yorkshire County Fire Service whose Fire Prevention Officers had been satisfied about general fire safety in the building as a whole. The Fire Certificates (Special Premises) Regulations 1976 did not apply.

43 The Fire Services Act 1947 places a duty upon the South Yorkshire County Fire Authority to make provision for fire fighting purposes. This duty extends to obtaining information about buildings, access to them and adequacy of water supplies. Obligations are also placed upon the Authority by the HSW Act to safeguard members of their Brigade, including those engaged in fire fighting activities. Responsibility for ensuring compliance with the Fire Services Act rests with HM Inspector of Fire Services under the Home Office (Home Departments) and with HM Factory Inspectorate for the HSW Act. The South Yorkshire County Fire Service notified to HSE as dangerous occurrences instances of firemen being so affected as to require medical treatment, as required by the Notification of Accident and Dangerous Occurrences Regulations 1980.

44 The provision of Sections 2, 3 and 4 of the HSW Act applied to the storage conditions on the site and imposed duties on the employers for the safety of their employees, others such as contractors working on the

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site, and the public who might be put at risk from the work activities. Environmental problems outside the site arising from activities on the premises and covered by other legislation would come mainly within the responsibilities of the local authorities' Environmental Health Officers (EHOs).

45 Following recommendations made in reports on other recent warehouse fires HSE is preparing regulations for the notification and marking of sites where hazardous substances are likely to be present. These regulations are intended to provide fire authorities with advance warning that special precautions may be necessary to safeguard firemen entering a building in the event of fire. The marking codes will follow those required under the Classification, Packaging and Labelling of Dangerous Substances Regulations 1984 (CPL Regulations). The proposed regulations could take no account, however, of the toxic nature of the products of combustion of the ordinary, unremarkable goods which comprised most of the contents of the Brightside Lane warehouse.

Enforcement

46 Responsibility for enforcement of the various statutory requirements, apart from those arising later under the Fire Precautions Act, had been undertaken since 1965 by the Factory Inspectorate (now part of HSE). The Railway Inspectorate assumed responsibility in 1979 for inspection of BR operations within the building and of a BR amenity block within the part then occupied exclusively by NCL. Although by the time of the fire there had been some detailed changes of occupation and types of activity within the premises, the arrangements set out in the Health and Safety (Enforcing Authority) Regulations 1977 placed enforcement responsibility with HSE rather than the local authority.

47 Factory inspectors last visited the warehouse in 1980 and reported that the transit shed and warehouse were "of exemplary quality, layout and operation". The risks to employees and to the public arising from the warehousing activities were minimal and it was decided that a further planned visit need not be paid for several years. A factory inspector visited the BRS workshop in August 1983 in response to the notification of their occupation. A further visit was paid in November 1983 to follow up matters raised at the initial inspection.

The fire

How it developed and was fought

48 The following paragraphs provide a resume of the progress of the fire. While it is not HSE's function to investigate the operational approach to fighting the fire, we are concerned with the health and safety issues which it raised. The relevant facts are therefore outlined so that our conclusions, drawn later, can be more readily understood; our report does not set out to provide a basis for analysis of every aspect of the fire fighting operation. The Fire Brigade's records became less detailed as the fire progressed but a clear understanding has been obtained from the South Yorkshire County Fire Service report, logs of messages sent and received and the evidence of those involved. The progress of the fire is illustrated in Figures 4 to 8.

49 The fire started in an area in the north west corner of Unit 1 where the warehouseman for Pickfords had his cabin. The last known person to have been in this area — the warehouseman — left the building at approximately 1205 hrs on 14 December 1984. About half an hour later a fork-lift truck driver employed by NCL heard a shout that Pickfords was on fire: he carried on working until he noticed part of the sheet metal partition wall separating Units 1 and 2 glowing red. When he moved pallets of collapsed cardboard cartons stored next to the wall they burst into flames. At 1250 hrs a retired ex-NCL employee who was visiting the site entered Unit 2. He felt heat radiating from the metal partition between Units 1 and 2 and saw flames sweep the entire length of the wall at roof level. He ran to warn an NCL clerk who called the Fire Service and raised the alarm.

50 During the next three hours the fire spread to all parts of the building except Unit 4, but it was 15 hours before it was brought under control. The number of appliances called to the site rose to 27, of which 17 were pumps, and the total number of firemen involved was about 300. Over 150 police officers attended the site.

51 At 1257 hrs when the first of 30 calls was received, the Fire Service Control mobilised two pumping appliances and a hydraulic platform from Darnall Road Fire Station, a hydraulic platform from Elm Lane Fire Station and an emergency tender from Division Street Fire Station. The first pumping appliances arrived at the premises at 1301 hrs, driving up into the depot yard at the side of Unit 1. Hose was run out and jets played on to the fire through the open roller shutter door using the water supply on the appliances. Smoke and flames passed quickly over the dividing wall into Unit 2 where stacks of goods were bursting into flame. The main firefighting effort was therefore transferred via the transit shed into Unit 2.

52 Attempts were made to obtain water from an internal hydrant in the depot yard near to the railway. The supply was insufficient to meet the demand and was supplemented by using the reserve tank of the hydraulic platform vehicle which arrived at 1307 hrs and by sucking water from the tank of a vehicle wash gantry in the depot yard. The meter bypass valve was opened without significant effect.

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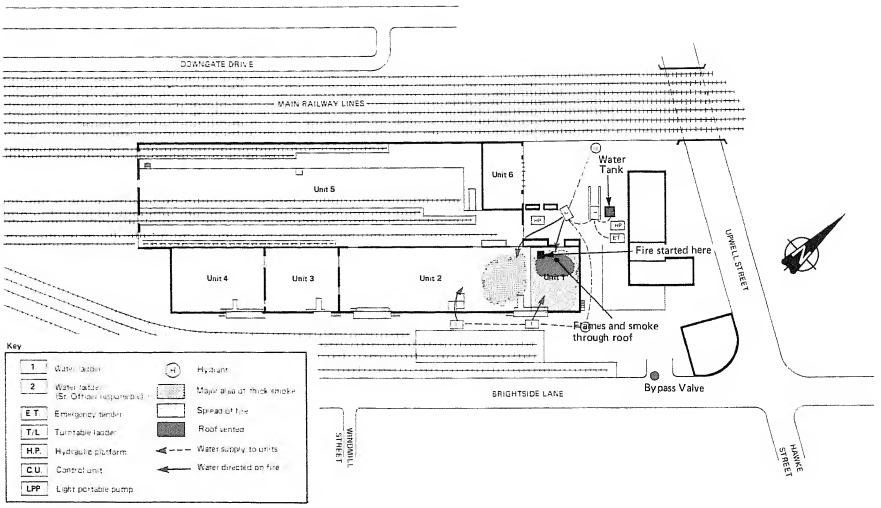

Fig 4 Fire at 1310 hrs on 14 December 1984

53 The Officer-in-Charge of the fireground activity had sent a message to "make pumps four" (ie to increase the number of pumping appliances attending the site to a total of four) at 1302 hrs. They arrived at 1308 hrs. One set into an internal hydrant at the approach corner of Unit 1 which also fed water up to the crews in the depot yard. The second pump, fed from this hydrant by the first pump, was deployed along the front of the building and the crew entered Unit 2 through an office from which the staff were evacuated (Figure 4).

54 The fire in Unit 1 was now so intense that approach was limited by radiant heat. The materials were stacked to a height of over 7 m, almost up to roof level, preventing firemen from directing water to the seat of the fire. The water supply was still not adequate to permit maximum use of the pumping appliances nor to allow the hydraulic platform's pump to be used.

55 At 1309 hrs the Officer-in-Charge sent a message to "make pumps six" and requested the attendance of Yorkshire Water Authority personnel to increase the water supplies in the area. At 1342 he sent a further message instructing that no large jets were to be turned down without informing the Water Authority personnel, thus indicating that the increased supply had been achieved by that time.

56 At 1316 the two further pumping appliances arrived. One was used to provide water from a fire tank just off Brightside Lane opposite the premises. (A fire tank consists of a chamber built below the road surface into which suction hoses can be inserted to draw water let into the chamber by a valve on a large bore pipe from a public main.) The other crew started to bring water supplies on to the fireground from hydrants located in Brightside Lane, Upwell Street and Hawke Street, although they eventually ran short of hose due to the distances involved.

57 The number of pumping appliances required was increased to ten at 1322 hrs and these had arrived by 1331 hrs. By now there were also three hydraulic platforms, one turntable ladder and one emergency tender on site.

58 The fire was advancing along Unit 2 at walking pace and crews sought to extend hoselines to get ahead of the flames and make a 'stop' — a point at which the fire could be checked. It was difficult to keep pace with the fire, particularly since flames were spreading at roof level into Unit 5 above the fire crews. Unit 1 was totally engulfed: the front roller shutter door had collapsed, fire had broken through some of the external wall sheets and the gable wall which was bulging outwards collapsed shortly afterwards. Figure 5 shows the position at 1335 hrs.

59 Stored goods in the transit shed were being ignited by burning material falling from roof sheeting and fears of a roof collapse led to firemen being withdrawn for a time. Crews re-entered Unit 5 to continue their attempts to limit the travel of the fire along Unit 2, but the fire continued to advance quickly, despite the use of a hydraulic platform to cool the roof.

60 As the smoke plume descended to the yard from which the first crews were working, conditions

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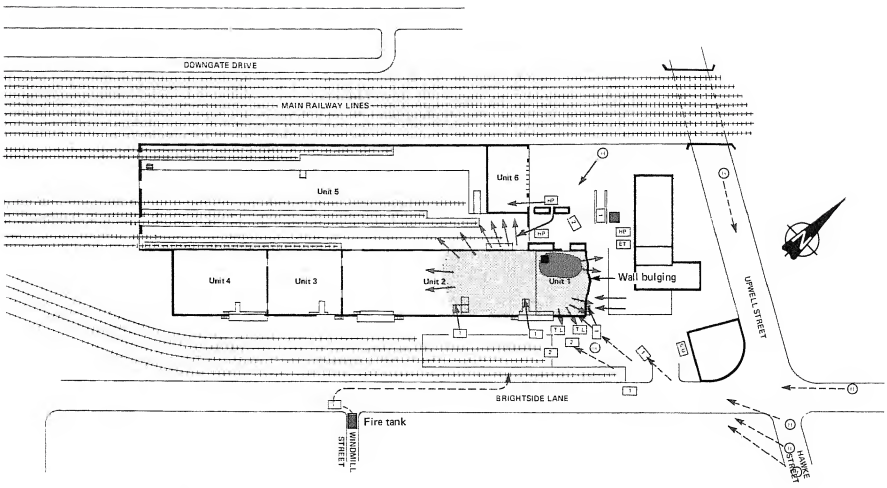
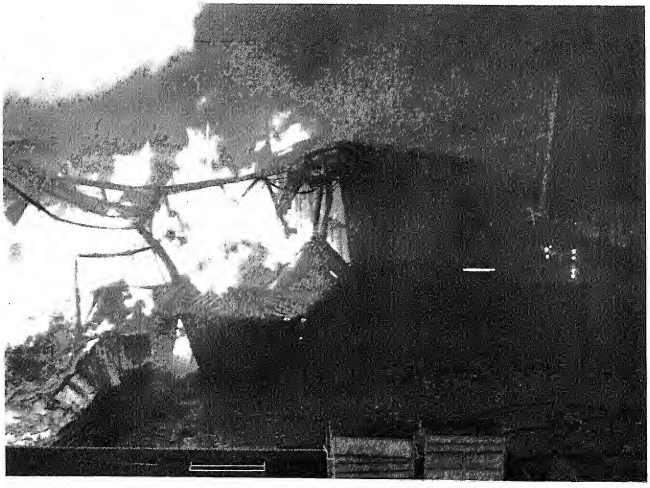


Fig 5 Fire at 1335 hrs on 14 December 1984



Fire in Unit 1 with collapse of the gable wall
South Yorkshire Constabulary

deteriorated. Smoke density varied throughout the afternoon and there were periods after 1330 hrs when it was necessary for breathing apparatus (BA) to be used by the pump operators as well as by the fire crews working in the yard area, in Units 2 and 5 and on the hydraulic platform.

61 By 1400 hrs the fire had spread throughout Unit 2 and the central part of the roof had vented (ie collapsed allowing gases and smoke to escape). Many small fires burnt among the stored goods in Unit 5. By 1400 hrs (Figure 6) the number of pumping appliances had been increased to 12 and another hydraulic platform had arrived. Water supplies were still unsatisfactory so one of the extra pumping appliances was used to relay hydrant supplies from the site entrance to the yard area. The other pump was sent to a hydrant in Downgate Drive. Delay occurred in

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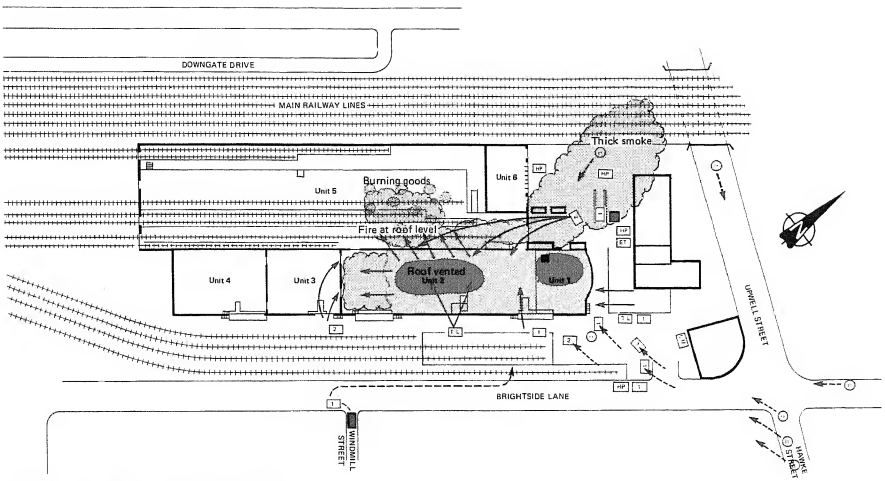

Fig 6 Fire at 1400 hrs on 14 December 1984

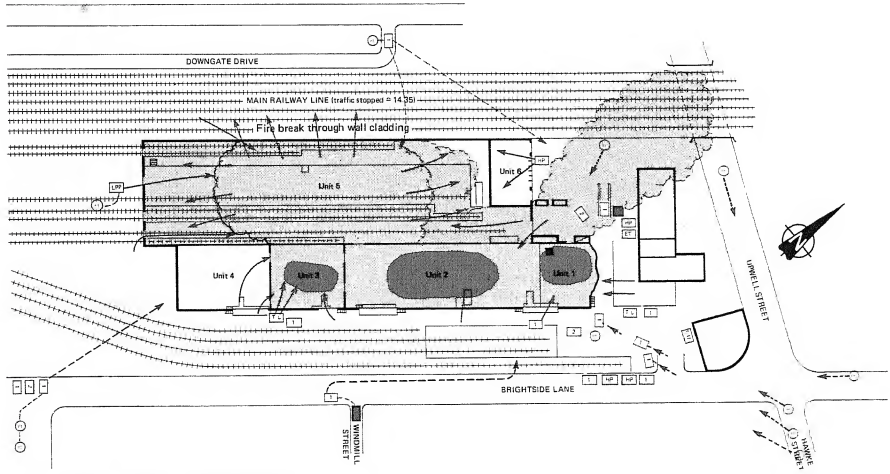

Fig 7 Fire at 1500 hrs on 14 December 1984

connecting this water supply to the fireground because the hoses had to be taken across the main railway lines from Sheffield and rail traffic had yet to be stopped.

62 Men worked from Unit 3 to cool the dividing wall to Unit 2 and a turntable ladder was used to project water through the open roof of Unit 2. However, the fire broke through into Unit 3 at approximately 1410 hrs. By 1430 hrs the whole of Unit 3 was involved and part of its roof soon vented. Fire crews were forced to withdraw from the loading bay entrance to Unit 3 and were repositioned in Unit 4 to cool the steel fire doors protecting the openings in the brick wall. Water was played on this wall up to roof level from Unit 4 and on to the roof above the brick wall by means of a turntable ladder so halting the spread of the fire along the warehouse section and saving the Unit.

63 Crews had been sent to the west end of the transit shed to seek further water supplies and to work upwind of the fire, the wind then being south westerly. At first they used only water from a hydrant on the site ring main which still lacked pressure. A "make pumps 16" message was sent at 1412 hrs, and these appliances arrived by 1426 hrs.

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Railway elevation showing exploded asbestos cement sheeting and buckled structure
Sheffield City Council

64 An appliance could not be positioned at the west end of the building because of the railway lines in the marshalling yard. Consequently appliances were set into hydrants on Sanderson Street and Newhall Road off Brightside Lane and water was fed across the marshalling yard to the crews at the west end of the building. A light portable pump was used near the internal hydrant to supply the crew in Unit 5. The inside of this part of the building was smoke logged by 1500 hrs. Firemen were evacuated when fire flashed over from Unit 2, but re-entered with BA until approximately 1600 hrs.

65 The fire continued to spread in Unit 5, causing explosive cracking of the asbestos cement wall cladding adjacent to the railway. Crews were deployed along this elevation, playing jets through holes in the sheets. Railway lines prevented close approach of appliances, so water supplies were brought from Downgate Drive, Sanderson Street, Newhall Road and also from the depot yard.

66 At 1438 hrs a "make pumps 17" priority message was sent and the responding crew arrived at 1446 hrs. By now the fire was so intense that crews and appliances were redeployed simply to minimise further spread. It was impossible to enter many parts of the building and crews fought the fire from the outside or from loading bay entrances which gave limited, but safe, access inside the building for a time. Figure 7 shows the position at 1500 hrs.

67 The whole of the transit shed was burning by 1540 hrs and fire then spread over the roof of Unit 6, to involve the whole of the premises except Unit 4. The office containing the goods manifest records, situated near the division between Units 5 and 6, was accessible until just before this time. Figure 8 shows the situation at 1615 hrs.

68 A shift change was due at 1800 hrs and men were relieved over the next hour as their replacements arrived.

69 At 1837 the Chief Fire Officer sent a message "fire surrounded". From then on a steady advance into the building by crews wearing BA was planned to extinguish the fire progressively. This went on through the night as jets and ground monitors (unmanned jets secured to portable frames) continued the damping down and cooling operations. A "stop" message was sent from the fireground at 0440 hrs to indicate that the fire was now under control.

70 From the morning of Saturday 15 December the relieving crews had the task of continuing to damp down the smouldering remains. It was now possible for firemen to gain access to most of the building. Smoke and steam emanated unpleasantly from the wreckage for many hours. Damping down operations continued until 1743 hrs on Tuesday 18 December 1984 after which the Fire Service maintained a watch to ensure that no further pockets of fire remained to be extinguished. Snow and rain had fallen in the meantime.

Effects on the structure and contents

71 Despite the intensity and duration of the fire the main columns were mostly undistorted; the worst-distorted rafters were those located over areas where hundreds of tons of stored plastic granules had generated intense heat and caused a rapid failure of structural members. The roof cladding and underdrawn lining in the north east corner of the warehouse failed as a result of the heat produced by the burning furniture in Unit 1. The profiled steel sheets forming the security division between the furniture store and Unit 2 were melted and distorted. The rafters of Unit 1, however, were largely undamaged.

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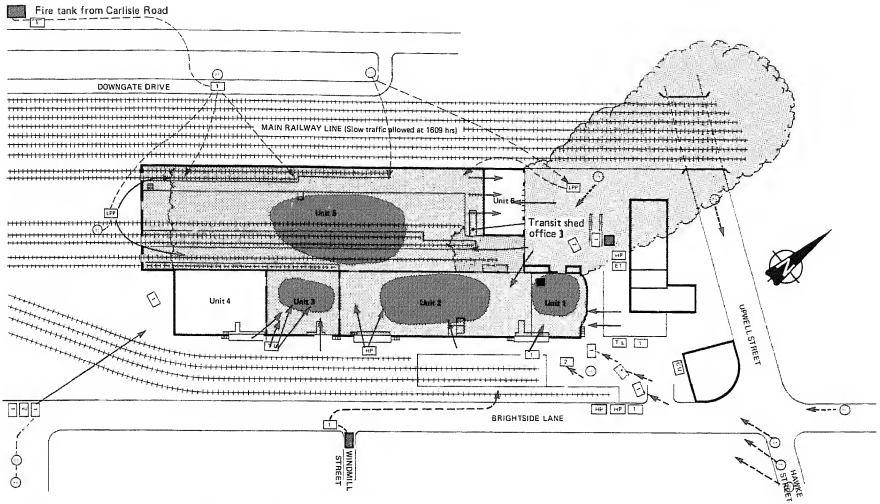

Fig 8 Fire at 1615 hrs on 14 December 1984

The scene on Saturday
South Yorkshire Constabulary

72 The sprayed asbestos insulation, discoloured by the heat, remained substantially intact. Where distortion or failure of the rafters had occurred, however, sections of insulation had cracked or fallen contaminating the areas immediately below. The asbestos cement cladding on the western elevation had shattered over much of its length, scattering small fragments across the adjoining railway lines.

73 The area of the warehouse at the south western end of the building which was separated by the 342 mm thick wall was virtually unaffected by the fire, although the wall cracked and distorted during the fire sufficiently to require its subsequent demolition. The walls separating the transit shed from the vehicle workshop protected the workshop from the worst ravages of the fire.

74 At the start of the fire the up-and-over doors in Unit 6 were raised, but when the fire developed over

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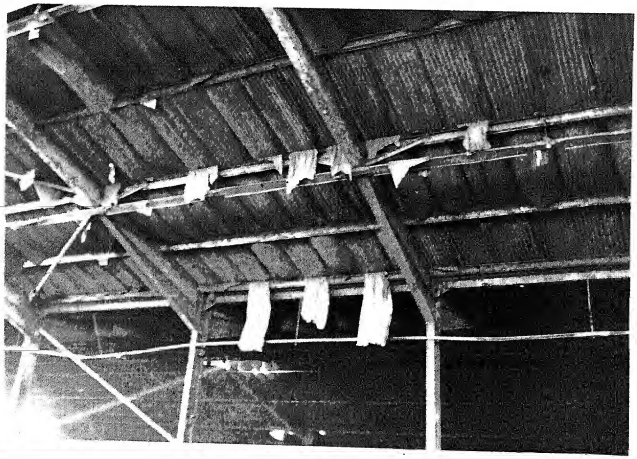
Effects of the fire on Unit 1
Chief Fire Officer, South Yorkshire County Fire Service



Coating peeled off underside of roof sheets in transit shed

the workshop roof and on to the high level control gear they dropped abruptly "like guillotines", narrowly missing firemen tackling the fire inside.

75 A contributory factor in the spread of fire was burning material falling from the underside of the roof sheeting which ignited materials stored below. Current test procedures for assessing the fire risk of such sheets (BS 476) did not accurately predict their behaviour during this fire. A further characteristic of Cellactite sheeting revealed in the fire was the propensity for the bitumen and asbestos coating to peel off the steel sheet. Depending on the extent to which the bitumen content was burnt away the resulting paper-like material either fell to the ground locally or floated on thermal currents in large pieces, to deposit itself down

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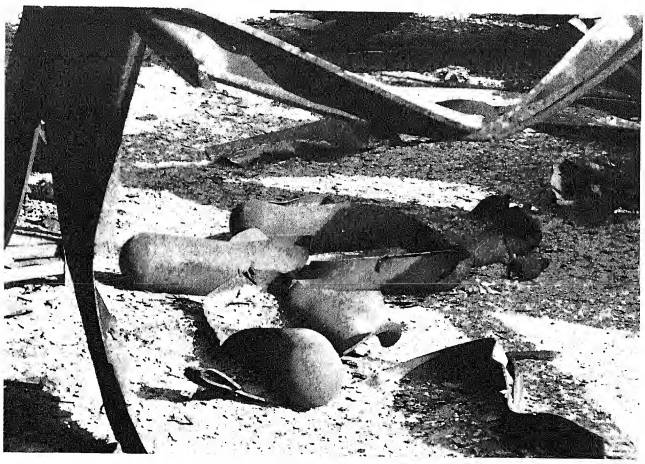
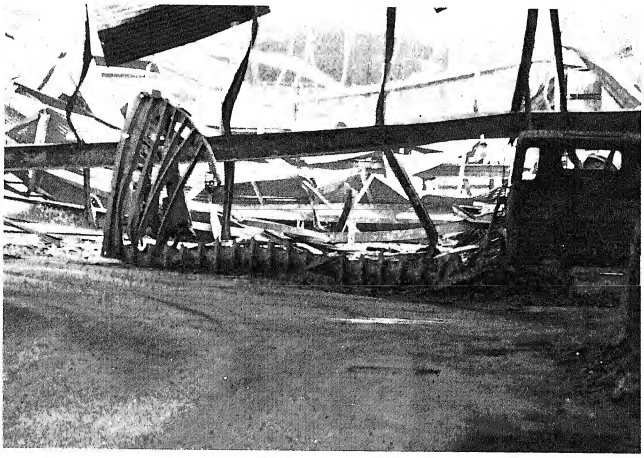
Exploded acetylene cylinders in Unit 5





Aluminium container in Unit 5 burnt away

wind of the site, in some cases several miles away.

76 *Unit 1* The contents of the furniture store were completely destroyed by the fire.

77 *Unit 2* Almost the whole of these contents was destroyed, severely damaged or contaminated after the fire.

78 *Unit 3* About 80% of the contents were destroyed by the fire (apart from the metals), the remaining 20% being severely damaged by fire and heat.

79 *Unit 4* Thanks to the protection afforded by the brick wall, closed sliding fire doors and the fact that firemen were able to get inside this unit, only 5% of the goods suffered damage, largely by water.

80 *Unit 5* About 60% of the contents of the transit shed were totally destroyed by the fire and 30% severely damaged by heat.

81 Most of the water treatment chemicals were consumed, as was a considerable proportion of the plastic granules. Four of the five acetylene cylinders

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exploded, while the fifth vented itself when the valving burnt out. In the central area all the timber was consumed, including some of the rail sleepers. The rail line alongside the main traffic road in the shed distorted and some of the structural steel work in the collapsed roof section was so affected that it had no residual strength. Three aluminium containers for transporting the polypropylene granules were almost completely burnt away and several vehicles were destroyed. The large rolls of PVC conveyor belting had been virtually baked and were badly charred. Three of the 60 drums of anthraquinone disulphonic acid salts leaked slightly.

82 The chemicals stored near the entrance survived the fire almost intact — scorched on the outside wrapping, but not substantially burnt. Some damage was done to the paper sacks of sodium nitrite, while several of the cardboard drums were split by being knocked over. There was some water damage, but most of the material was fit for recovery after the fire.

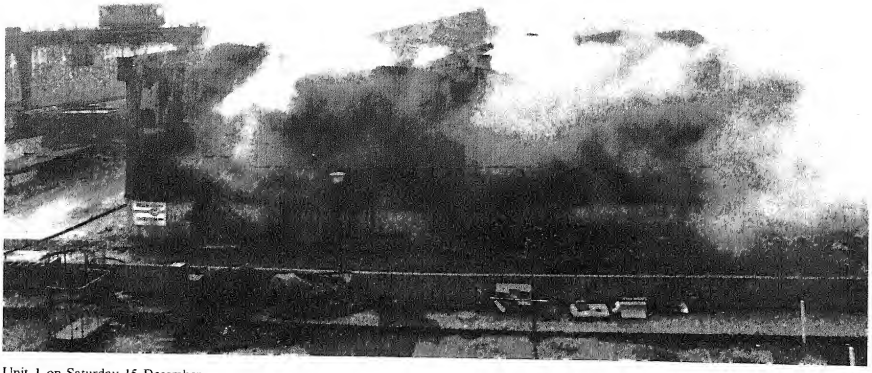
83 *Unit 6* The whole of the inside of this unit was smoke damaged, but there was no significant penetration by the fire at any point.

Investigation

84 The South Yorkshire County Fire Service, in fulfilling its responsibilities for the fire-fighting operations, also had a duty under the HSW Act to see that the health and safety of firemen was safeguarded, so far as was reasonably practicable. As a matter of normal practice HSE does not seek to interfere in any way with the conduct of fire fighting operations. It stands ready to give advice if it is sought, to answer any questions which may be raised on whether the proper degree of care is being achieved and to ensure that all appropriate lessons are learned and applied. In accordance with normal practice, therefore, HSE's full investigation began after the blaze was extinguished. Advice was sought by the fire brigade both from HSE and EHOs: the latter were called in at an early stage when questions arose over risks to the health of the community.

85 Early in the fire the police became concerned that the dense smoke from the fire might adversely affect residents in a large housing estate downwind. They contacted the EHOs in Sheffield who visited the fireground at about 1530 hrs and were later joined in their enquiries by the Rotherham EHOs who had been alerted about the asbestos fallout by a member of the public. The atmospheric concentrations of asbestos fibre and possible toxic gases were monitored by EHOs from both authorities; additionally, those from Sheffield monitored conditions on the fireground and gave advice on the protection of firemen. The activities of the EHOs and consideration of the results of their monitoring by HSE's Employment Medical Adviser (EMA) are described in paragraphs 182 to 203.

86 HSE inspectors were not told about the fire by those on site but became aware of it through publicity that evening; the Principal Inspector of Factories (Engineering Group) visited the fireground next morning where he found the fire brigade damping



Unit 1 on Saturday 15 December

South Yorkshire Constabulary

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down. A site meeting with the owners and other relevant parties was arranged for the following Monday when it was anticipated that the fire brigade activities would permit access to the building. The owners were asked to prepare a site plan and inventory of chemicals and other materials before the meeting, which would also consider the safety of the remaining structures. Until then no private individual would be permitted access to the site. Arrangements were made for an HSE construction engineering inspector and the Principal Inspector (Construction Group) to attend the meeting to advise on structural safety and necessary demolition work.

87 Late on Saturday evening the HSE Area Director was contacted by the fire brigade Divisional Commander who inquired about the risks to firemen from contamination by asbestos on the fireground. The Area Director concluded that the precautionary procedure described to him was adequate. It was agreed that an inspector's attendance would be of no immediate help and a site meeting was arranged for the following morning.

88 On Sunday 16 December the Area Director and a Principal Inspector met the Divisional Commander and the Chief Fire Officer of the South Yorkshire County Fire Service, two EHOs who had been involved with the fire since the Friday afternoon and their Director, who was dealing with fallout of asbestos from the roof sheets which had affected a large area downwind. The group made a tour of the building, in which pockets of smouldering fires remained.

89 The Principal Inspector advised the Divisional Commander of the Fire Service to construct a sand bund wall around chemicals in Unit 5 to minimise escape of contaminated water, and to arrange for firemen handling hoses in this area to wear PVC gloves instead of conventional leather firegloves. This advice was quickly implemented.

90 By the time of the meeting on Monday morning the incident had passed through its emergency phase and it was largely a mattter of taking stock of health and safety problems, and deciding how to proceed. The owners of the chemicals which had caused concern, Laporte Chemicals Ltd, were asked to send a representative to advise on any risks posed by their goods. He said that the risks were much less than the Fire Service had thought prudent to assume during the fire, and arrangements were made for disposal of the chemicals by specialists under the supervision of the Pollution Control Officer of the South Yorkshire County Council in consultation with EHOs from Sheffield City Council. Arrangements were made with the Police for the entrances to the building to be guarded until a private security company could take over, principally to avoid theft of valuable metals but also to avoid unauthorised access to the chemicals or a dangerous part of the building. The property owners, NFC, agreed to engage a competent civil engineer to determine on a day-to-day basis the structural safety of the building during salvaging operations.

91 The Principal Inspector (Engineering) returned to the site on Wednesday 19 December to meet contractors who had been appointed to clear the site of goods and damaged structure. The contractors' proposed methods of work were discussed and their experience established. Structural problems were discussed with the NFC-appointed civil engineer. The NFC site managers were consulted about the nature and location of the materials stored and the relationships between the various NFC companies on site and their customers. The Pickfords area, Unit 1, was then undergoing forensic examination under Police surveillance.

92 Up to this time no complaint had been received by HSE and it was expected that future visits to the site by HSE inspectors would be confined to inspection of the clearance operation. Visits were subsequently made in this connection by a Construction Group inspector on 22, 27 and 28 December 1984, 3, 22 and 23 January 1985 and 14 March 1985.

93 However in January events took a new turn as the local secretary of the FBU began collecting information from firemen who had attended the fire and were complaining of ill health. Allegations by the FBU that inadequacies during the fire fighting operation, particularly in respect of provision, maintenance and use of BA, had resulted in some firemen being unnecessarily exposed to smoke and fumes received national media attention. The presence on the site of unspecified chemicals was believed by the FBU to be responsible for the toxic fumes blamed for the respiratory problems described by some firemen.

94 Enquiries immediately launched by HSE inspectors established that more than 200 firemen had responded to an FBU questionnaire and a number had reported symptoms of varying nature and severity. At a meeting with FBU officials on 23 January 1985 HSE agreed to ask its Employment Medical Advisory Service (EMAS) to undertake a medical assessment of all firemen whom the FBU identified as having suffered significant ill effects.

95 Medical examinations of firemen began with a list of 11 names supplied by the FBU. To obtain a comprehensive picture of the extent of ill health experienced by firemen following the fire, the Fire Service was asked to identify all firemen who reported ill effects. A Fire Service Weekly Order was issued to which 40 firemen had responded by 5 March 1985; accordingly EMAS extended their medical assessments and a report of their investigation appears at paragraphs 168 to 185.

96 Early provisional information from EMAS supported the firemen's claims that their symptoms were the result of exposure to smoke and fume. The HSE therefore began a detailed enquiry to build up a

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picture of the fire fighting operation, to determine how this exposure had occurred.

97 So many had been involved in the fire that it proved necessary to interview 110 firemen. Formal written statements were taken from 96 firemen. The description of the problems emerging from the fire in paragraphs 104 to 185 was built up from this first-hand information. The conclusions reached by HSE were substantially in line with those eventually emerging from the Fire Service's own debriefing report.

98 Forensic examination of the remains of the building and its contents began as soon as possible, to try and determine the cause and origin of the fire. The Police limited access to the vicinity of the furniture store (Unit 1) to give priority to experts from the Home Office Forensic Laboratory. Privately appointed forensic experts and Fire Service investigators were subsequently allowed access. An opportunity was afforded to all interested parties to discuss the forensic evidence at a meeting held at the Home Office laboratory on 14 February 1985.

99 At an early stage in the Police investigation witnesses established that the fire had started in the north west part of Pickfords furniture repository, where the warehouseman's cabin was situated. A detailed layout of this area can be seen at Appendix 2.

100 During the course of their examination of the remains in Unit 1 the forensic experts uncovered a piece of cable about 15 m long which had supplied electricity to the warehouseman's cabin from a socket outlet just inside the access door. It had run across the floor through piles of carpets, emerging near the cabin. This supply lead was made up from three lengths of flexible cable, including a central length of four-cored cable in which one redundant conductor had been cut back. The conductors in the sections of cable had been taped together and over-wrapped with packaging tape. One joint was recovered undamaged after the fire.

101 Examination of witnesses failed to identify positively the person who had installed the supply, but the evidence showed that it had been in use for many months. The cable had terminated in a socket outlet into which a double adaptor had been plugged, to provide a supply for the light and the fireclay panel heater in the cabin. The flexible cables from the plugs in the adaptor had passed over the threshold, the one for the light being stapled up the inside of the door frame. The cable to the heater opposite the door had trailed loosely across the floor.

102 The Home Office Forensic Laboratory report refers to bad practice in joining together the pieces of wire making up the extension lead supplying electricity to the cabin, but points out that there was nothing to suggest that this was instrumental in starting the fire. Nevertheless, the experts' consensus view was that the fire began in the area of the warehouseman's cabin. While the possibility of deliberate ignition or the careless discarding of a cigarette could not be ruled out as possible causes of the fire, the more likely cause was electrical. Tests carried out on the fireclay panel heater indicated that both it and its associated wiring might have presented ignition hazards. The discovery that the heaviest degree of burning in the cabin was in the area in which the heater had been standing supported the view that the heater was involved at an early stage in the fire.

103 The majority view of the forensic experts was thus that the fire started in the cabin, the cause probably associated with the fireclay panel heater in use at the time.

Problems emerging from the fire

Problems relevant to the Fire Service

104 The Fire Service faced several immediate difficulties when they arrived at the fireground. First, the fire had taken such a hold that the Pickfords furniture store in Unit 1 was already lost. Indeed, the fire was spreading into Unit 2 and soon would prove to be beyond control. Second, the water supplies on site were at once found to be inadequate for checking such a blaze. Third, the railway lines restricted access by appliances to two sides of the building. Fourth, there was uncertainty and therefore apprehension about the contents of the warehouse and the hazards that might be encountered.

105 Once the roof had collapsed and combustion gases could escape, inrushing air created furnace conditions in the building which no amount of water could hope to quench until the fire had exhausted its supply of fuel — the stored goods. Despite the rapid spread of the fire, however, there was no threat to the lives of any occupants, all of whom had been able to evacuate the building safely and even move their cars out of danger. No other property was seriously at risk.

106 Thus, by Fire Service standards, it was a relatively simple though very large fire: for a while it involved the attendance of nearly half the fire fighting appliances in South Yorkshire in attempts to bring it under control. It is not part of HSE's function to form judgments about how the Fire Service tackled the fire. Senior fire officers were clearly faced with a difficult situation and a perplexing choice between attempting, at some risk, to bring the fire under control and save part of the building or simply containing it until its fuel was exhausted, with least possible risk to firemen, bearing in mind that the lives of occupants and other property were not in jeopardy. Striking the balance between such choices is not easy. Better information about the water supplies, the physical problems likely to be met and the probable contents of the building might have been available, and might have assisted, had the Fire Service performed a more recent inspection of the complex under Section 1(1)(d) of the Fire Services Act 1947 but, constrained by the resources available for this work,

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priority had been given to other premises where risk to life was judged to be greater.

107 The fire spread quickly into Unit 2 because the metal sheet partition reached only to the underside of the asbestos underdrawn insulating roof lining. The metal sheets themselves readily absorbed and radiated heat, setting fire to materials in Unit 2 simply by contact: they melted where they were exposed to high temperature from within the furniture store. Effective fire compartmenting might have contained the fire and enabled the Fire Service to control it at an earlier stage.

108 In certain multi-storey storage buildings, according to the height of the building, the Building Regulations set limits of either 1000 m^2 floor area per storey, or 21 000 m^3 volume on compartment size, but a single storey building may have unlimited floor area and cubic capacity without compartmentation. The Brightside Lane building was too extensive for the fire brigade to be able to span with their water jets.

109 The hot gases trapped in the underside of the roof span were able to travel along the space between the outer roof and the underdrawing, melting and burning the bitumen of the inner skin of the outer roofing sheets and weakening the lightweight framework on which the underdrawn asbestos sheeting was suspended. When this framework failed the asbestos boards fell down, enabling the burning bituminous asbestos felt to fall from the roof sheeting and set fire to the goods below. Until the suspending framework failed and the asbestos boards fell they masked the developing fire and the firemen were prevented from fighting it from below with their jets.

110 It was reported that the burning bituminous material easily ignited stored goods heated by radiant heat and so contributed to the spread of fire at ground level. The roof sheeting had been tested in accordance with the standards specified in BS 476, Fire Tests on Building Materials and Structures, and met the requirements of Section E of the Building Regulations. The latest revision of BS 476 takes into account any dripping from a test specimen but does not provide for any such phenomenon to be indicated in the classification category.

Operational

111 *Accuracy and use by the Fire Service of prior information* The Fire Services Act 1947 gives fire services power to enter premises to acquire information necessary for fire fighting purposes in order to discharge the duty placed upon them by Section 1(1)(d) of that Act. In the South Yorkshire County Fire Service this information is obtained by firemen working from operational fire stations and is transferred on to a card, designated FS1250, which is kept in a file on each pumping appliance expected to respond from the local fire stations to fire calls involving buildings within their operational area. A copy of the FS1250 should have been kept in the Control Unit, a mobile operation centre.

112 For the Brightside Lane warehouse the relevant fire station (No 23) was at Darnall Road. The date of the last visit to the warehouse for the purposes of Section 1(1)(d) was 22 June 1978, at which time the premises were occupied by NCL. The predetermined attendance, the appliances which should respond to an initial call, was two pumping appliances (referred to as water ladders) having water carrying capacity of about 1730 litres, and a turntable ladder with a built-in pump. At the Darnall Road Station the turntable ladder had been replaced by a hydraulic platform with a maximum vertical reach of 25.5 m.

113 The size of the predetermined attendance varies according to the category of risk allocated to the area in which the premises are situated. For Category A — the high risk area — initial turnout should be three pumps, two of which should arrive at the fireground within five minutes and the other within eight minutes. For Category B the turnout should be two pumps, one to arrive within five and one within eight minutes. The predetermined attendance shown on the FS1250 for NCL was therefore appropriate to a Category B risk area although it had at one time been Category A. At the last inspection the firemen recorded that the roof of the building was made of asbestos cement sheets like those on the western elevation next to the railway line, since they were similarly shaped.

114 The FS1250 referred to the four inch internal main on the site which was intended to be used for fire fighting purposes and recorded the positions of hydrants. FS1250 indicated that fire fighting operations would require ten jets (ie ten water nozzles), calling for 50 lengths of hose, each 22.75 m long, that the water required for those ten jets — at 680 litres a minute — was 6800 litres a minute and that it would take 50 men to operate them. This would call for the attendance of ten appliances, since pumping appliances in South Yorkshire carry five men as a general rule. The jets referred to are those on nominally 6.3 cm diameter hose as distinct from the smaller diameter nozzle (about 80 mm) on the fixed hose reels fitted on the appliances.

115 The FS1250 also indicated that breathing apparatus would be required at the Brightside Lane warehouse due to the storage of PVC materials as noted at the last visit. While the information about the goods stored was not up-to-date, it was nevertheless still appropriate to require the use of BA when dealing with a fire at these premises. Regardless of the nature and extent of any chemicals which might be stored, fire within the premises was likely to give off toxic products of combustion to which it would be undesirable for anyone to be exposed, particularly while the roof remained intact and the combustion products remained trapped within the building. In the event, during the short time it took for the first appliances to reach the site from their stations, crews were fully occupied with dressing in fire kit and communicating with the central Mobilising Control, and did not consult the FS1250.

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116 The performance of the internal water main had not been checked by the Fire Service since the mid 1970s. Apprehension about their liability for any damage when carrying out full-scale tests contributed to the length of time since the last test but a major influence was their need to reassess priorities following fires involving multiple fatalities. Naturally this caused operational staff to concentrate more on premises posing a risk to life than those such as Brightside Lane where the greater risk was to property. Furthermore the industrial area in which the warehouse was situated had been in decline for several years with a corresponding diminution of anticipated risk, hence the change of risk category for the area.

117 A South Yorkshire County Fire Service Order (No 11), revised in September 1980, set out the procedure for dealing with all aspects of fire fighting water supplies as part of their duty under the Fire Services Act. A coordinating (civilian) Water Officer was appointed at the South Yorkshire County Fire Service headquarters to liaise with the Water Authorities where necessary. Order No 11 intended the Fire Service to inspect private hydrants twice a year and make a written report if a defect was discovered; the positions of all relevant hydrants, whether public or private, were to be identified to avoid delay in locating them in an emergency. One of the hydrants on the private main which was identified on the FS1250 could not be located, despite a thorough search after the fire.

118 The Order also set out the general policy of the South Yorkshire County Fire Service to inspect bypass valves on private mains annually by agreement with the owners. No relevant records of inspections were produced in respect of the private main or its associated meter bypass valve. The property owners — NFC Property Group — had not been approached by the South Yorkshire County Fire Service nor had they appreciated the need to monitor the performance of their private internal main.

119 *Liaison between visiting Fire Prevention Officers and operational staff* The Fire Prevention Department of the South Yorkshire County Fire Service, from their Divisional Headquarters at Handsworth in Sheffield, had been involved with the development of Unit 6 into a vehicle workshop and the preparation of a certificate covering means of escape in case of fire. Officers had visited the premises in connection with the fire protection of the offices and workshop, in the course of which visits they had become familiar with both the staff and the nature of the premises. Arrangements existed (by use of their Form FS925) for the exchange of information between the Fire Prevention Department and the Operational Section to update the details on the FS1250, but no exchange had taken place.

120 *Control and communications at the fireground* Overall control of the operations on the fireground was the responsibility of the Officer-in-Charge, normally the most senior officer on site. He would operate initially from an appliance or car identified by a flashing blue light. The central Mobilising Control would normally dispatch a Control Unit to the fireground when the number of appliances reached five or when requested to do so by the Officer-in-Charge. A Headquarters Duty Officer would be responsible to the Officer-in-Charge for the function of the Control Unit. His responsibilities would include maintaining records of movements of personnel and appliances on and to the site, communications on the fireground and to the Control Centre and keeping records of them, ensuring that officers wore clear identification of their allocated duties, and arranging for the supply and servicing of BA. The Duty Officer should also appoint an officer to be BA Main Control to operate if Stage II BA procedures were introduced (see paragraph 142) and an officer to be in charge of BA servicing.

121 The investigation revealed several instances where designated tasks had not been carried out in accordance with Fire Service orders and established procedures. The departures from expected performance by both firemen and officers at senior level contributed to shortcomings in fireground control, coordination and discipline and gave rise to a number of the issues considered in this report. The Chief Fire Officer has been informed of all inadequacies which came to light during the investigation.

122 The local method of communicating on a large fireground is by means of hand-held battery-powered Storno radio sets. On first attendance officers speak to each other using one specific channel on the radio sets. Once the Control Unit has been established on a fireground it issues an instruction to switch all sets to a second channel. Officers can then speak only to the Control Unit, which itself is in communication with the central Mobilising Control. For protracted fireground activity the Control Unit would also be connected to the public telephone system.

123 The Storno radio batteries are subject to a weekly recharge, which requires the complete discharge of the battery first. Before the Brightside Lane incident it was the custom throughout the South Yorkshire County Fire Service to recharge the batteries at the end of the week. Therefore, on the day of the fire (Friday) the radios were brought into use with only partially charged batteries which soon expired. Communications between fireground officers and the Control Unit became impossible after very few messages had been sent, when an aerial on the Control Unit became waterlogged. Staff in the Control Unit were still able to speak to the Mobilising Control by radio, however. Action was taken immediately after the Brightside Lane fire to stagger the days on which stations within the South Yorkshire County Fire Service recharged their Storno radio batteries.

124 In the absence of effective radio communication on the fireground the Duty Officer should designate firemen to act as runners and provide them with

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Scorched sacks of sodium nitrite. Sand bund to retain surface water. Slight scorching of shrink-wrapping on Natene (polyethylene) sacks. *Sheffield City Council*

distinctive tabards so that they are not diverted to other duties. Similarly, officers with designated fireground roles should also wear colour-coded tabards. No runners were so designated and some officers did not wear relevant tabards.

125 *Environmental — Information about Building Contents* The Chief Fire Officer expressed concern after the fire that inadequate information was available about the nature and extent of the goods present in the building. During the fire, warehouse employees were interviewed in the Control Unit to assist in drawing up a plan of the building showing the nature and location of the stored goods. The information was supplied from the employees' memories since they were isolated from the offices in which their records and manifests were kept. The office in which the longer-term warehouse records were kept survived the fire intact; the office in which the transit shed manifests were kept, although eventually destroyed by the fire, was accessible until approximately 1530 hrs. The understandably shocked employees, being interviewed in the Control Unit at the site entrance some 45 m away from the nearest point of the burning building (Unit 1), could not be aware of the conditions in the transit shed (Unit 5), where both offices were located. They were not asked where their records were. Laporte Chemicals Limited were not contacted for advice.

126 The chemicals to which firemen were potentially exposed during the fire fighting operations on the Friday were limited mainly to those owned by Laporte, which were stored near the north eastern entrance to the transit shed. Other recognisable chemicals in various parts of the building, such as small tins of weak formaldehyde solution, water treatment chemicals and household bleach, were all in areas so heavily involved in the fire that firemen were unlikely to get close enough to be contaminated by any spillage from ruptured containers. The Laporte chemicals, which were all stored in sacks or drums on pallets, were involved in the fire for a short time following a 'flash- over' towards Unit 6. Damage to the sacks and drums seemed more likely to have resulted from the impact of water jets and firemen's urgency in removing labels for the purposes of identifying the contents to the Control Unit. The torn sacks and ruptured drums spilled some of their contents, which contaminated water from the fire hoses as it built up nearby. On the advice of the EHOs the area was bunded, by using first a charged hose and later sand.

127 The presence of the Laporte chemicals, and the difficulty in quantifying any risk associated with the drums of anthraquinone disulphonic acid salts, increased apprehension — later shown to be unfounded — about the possibility of firemen being exposed to further unknown risks. There were adequate supplies of chemical protection suits at the fireground, but these were not used, despite apprehension about the presence of chemicals and information supplied to the Control Unit at 1746 hrs that complete protective suits were needed in connection with "disulphate salt".

128 The known cases of immediate contact with stored chemicals are confined to one or two firemen who removed labels from packages, so it may be supposed that subsequently reported ill health among firemen arose from exposure to atmospheric contamination resulting from the products of combustion, rather than from physical contact with chemicals in the warehouse. While the full scientific appraisal of the likely contents of the gases and their inter-reaction in the heat of the fire could take many months, the gases likely to be produced from the combustion of individual materials at varying rates and temperatures can be forecast: smoke

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and fumes evolved in various parts of the building could contain cyanides, isocyanates and carbon monoxide (from polyurethane foam-filled furniture), hydrochloric acid (from PVC materials), sulphur dioxide (from, among others, the bituminous content of the roof sheet coating) and nitrous fumes resulting from the general fire. It reinforces the view offered by EHOs on site that there was likely to be a "cocktail" of toxic gases given off; this would be the case in almost any serious fire, irrespective of whether chemicals were involved. The cocktail on this occasion was probably little different from the contents of smoke plumes given off from other serious fires.

129 Experience of warehouse fires in recent years has indicated the need for information about potentially hazardous contents and their disposition to be available to the emergency services. The recent CPL Regulations now enable warehouse operators to assess the hazards from materials they store and to manage their undertakings accordingly. The Health and Safety Commission has now made proposals for regulations to require sites to be marked indicating the presence or possible presence of dangerous substances and to ensure that relevant information is passed on to fire services. However, it will still be for fire services to ensure that any site hazard warning or information provided by HSE is supplemented by information obtained during their own inspections and kept readily available for use.

130 *Decontamination Procedures* In fire service parlance decontamination means a full-scale hosing down (usually with the fireman being treated continuing to wear the BA in which he has been working when he became contaminated), followed by a complete change of clothing. This standard decontamination may be carried out in a tent-like structure and lagoon constructed on the fireground or in a special-purpose mobile unit brought to the site. Full-scale decontamination can take between 15 and 20 minutes per man.

131 Uncertainty arose on the fireground about risks from contaminants to which firemen might be exposed. While the presence of the Laporte Chemicals was known very soon after the first appliances arrived at the site, the major concern centred on the asbestos material contained in the bituminised felt particles which were falling away. It had also been recognised that the structural steelwork in the warehouse section of the building was protected by Limpet sprayed asbestos, parts of which were being disturbed, with the risk of fibre release. After consultations had taken place on site between the Chief Fire Officer and the EHOs because of possible contamination with asbestos, instructions were issued that firemen leaving the site should remove fire jackets, turn them inside out and bag them for "special" cleaning: "wet-legs" (waterproof over-trousers) and boots should be hosed down before the firemen left the site. Since some crews had already returned to their stations, the Chief Fire Officer sent a message from the Control Unit at 1734 hrs to inform Stations 13, 23 and 24 that all personnel who had been at the incident should have their uniforms cleaned before further use. Normally, uniforms would simply be hung up to dry and only sent for cleaning when soiled: routine arrangements for this cleaning, which was different from the special cleaning required for asbestos-contaminated garments, had been made with commercial cleaners.

132 A further message was sent by the Chief Fire Officer at 1736 hrs ordering the despatch to the fireground of one pump and the Decontamination Unit. Although this Unit arrived at 1805 hrs and remained at the site entrance for a period, it was not taken into use since full-scale decontamination was not considered to be necessary.

133 Most, but not all, of the firemen had their wet-legs and boots hosed down before they left the site. It appears that individual crews made their own arrangements for this to be done until about 1930 hrs when a decontamination area, including arrangements for collecting jackets, was set up near the main gate.

134 The instruction that jackets should be sent for special cleaning was not satisfactorily communicated: the message intending to repeat the site instruction did not make it clear that special rather than normal cleaning was required nor was it sent to all stations to which firemen may have returned without having been given the instruction on the fireground.

Breathing apparatus

135 In the weeks following the Brightside Lane fire considerable publicity was given to the FBU's allegations that the ill health of firemen who had attended the fireground was directly attributable to the failure of the South Yorkshire County Fire Service either to provide and maintain adequate BA or to allow its members to use it when necessary. In investigating the fire fighting operation, therefore, HSE inspectors paid particular attention to this aspect of the employer's responsibility for the health and safety of employees.

136 *Provision* The South Yorkshire County Fire Service sets one of the highest standards in the country in the provision of BA. With a total of some 1200 employees, of whom about a quarter are on duty at any one time, it carries 284 sets of BA with 263 spare cylinders. Each pumping appliance (water ladder) whether based at a station manned by a full-time crew or by retained (ie part-time) firemen, is equipped with five sets of BA. Of the three emergency tenders provided in the county, two carry six sets of BA and the other seven. In Divisional staff cars there are 14 further sets with a reserve of three sets at each of the five Divisional Stations. The Fire Service Training Centre at Rotherham has 16 sets which can be brought into use if necessary. Although the specialist appliances - the hydraulic platforms, turntable ladders and rescue tenders - do not carry BA, the scale of provision on appliances which are already in attendance at incidents to which the specialist appliances are called normally

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ensures that BA is available for all those firemen who need to use it.

137 Spare cylinders for the sets are distributed throughout the county and recharging compressors have been installed at all of the fire stations manned by whole-time crews as well as at the Training Centre. The desirability of acquiring a portable compressor to recharge cylinders on site has been given further consideration by the South Yorkshire County Fire Service since the Brightside Lane fire.

138 *Use* Firemen's lives may depend on the use of BA to provide an adequate supply of clean air totally independent of the atmospheric conditions in which the firemen might have to work. Such vital equipment must be meticulously prepared and its use subject to rigorous control. The Home Office (Fire Department) has therefore provided very specific guidance to fire authorities on this subject, through the procedures described in the *Manual of Firemanship* ('The Fireman's Bible') and by Technical Bulletins which describe in precise detail the equipment and systems to be adopted nationally. The *Manual of Firemanship* emphasises the importance attached to the prescribed discipline when working with BA.

"It is important that every man who is required to wear BA is not only adequately trained and thoroughly understands the 'Procedure' in all its aspects, but also that he faithfully and meticulously carries out the 'Procedure' at a fire or other incident, for on each member of the team or crew will depend the success of the operation in hand. It is not only a question of the man's own safety, but also that of his colleagues with whom he may be working at the time or subsequently. The success of BA operations does not rest alone with those men working inside the building. It is not sufficient for men to be completely confident of their ability to work with BA in hazardous conditions; they must also have full confidence that the control and support arrangements outside the building are beyond reproach. The whole success of any BA job is teamwork, and it is encumbent on all those engaged in the operation to ensure that they are competent and fully conversant with their BA and with the 'Procedure' for its use.

"BA is worn at a fire or other incident only on the instructions of the officer-in-charge who may, in fact, be a leading fireman or even a fireman in charge of the first appliance to arrive. The general principle should be that BA is worn whenever its use will facilitate the location and extinction of a fire, or at any other incident when, by wearing BA, discomfort and possible injury to a fireman's respiratory organs can be avoided.

"The decision to order BA to be worn will depend on a number of factors, such as the volume and type of smoke; whether the atmosphere is deficient of oxygen, is toxic or has a high temperature; the length of time men are likely to be exposed, or whether there is a hazard from radioactive substances.

"As soon as instructions have been given for BA to be worn, the officer-in-charge must nominate a BA Control Officer so that Stage I of the 'Procedure' can be put into operation. This is a simple act which need cause no delay as the control officer could be the pump operator who accepts the tallies from the wearers before they go in, having first made sure that the information required on the tallies, including the cylinder pressure, has been checked by the wearer when he dons his set, and is recorded on the tallies....

"If the incident is seen to be large or is likely to be protracted, Stage II of the 'Procedure' may be necessary before action is started. In such cases the officer-in-charge may decide to await reinforcements before committing men to work if his availability is inadequate at the time; for example, the officer-in-charge may decide that communications equipment, which might not be available on the first attendance, is necessary before the men enter the premises.

"When plans of the building or hazard are available, they should be referred to as soon as possible, or if an occupant of the building who has a comprehensive knowledge of the layout of the building is present, he should be consulted. Any time devoted to consultation and study of the situation may result in a considerable saving of time and effort later."

139 The Manual is quite explicit on the subject of evacuation of premises by firemen wearing BA: "If men wearing BA hear repeated short blasts from a whistle, they should immediately make their way out of the premises".

140 The purpose of BA control procedures is to ensure that, once the Officer-in-Charge has decided to send a fireman wearing BA into a building, sufficient details are kept in a safe position outside the building to enable the safe use of the BA to be effectively monitored. Details of the fireman concerned, the volume and pressure of his air cylinder and the time at which the set was started have to be written on the tally, a coloured 125 mm x 38 mm plastic tag which is normally attached to the BA set when not in use. As soon as the set is taken into use the tally should be removed from the set and clipped into a Control Board on which the estimated "time of whistle" (the time at which a low pressure warning whistle is due to sound on the set) is recorded. The Control Board for Stage I entry is kept on the appliance, usually by the driver/pump operator. It is normally expected that firemen using BA will return to the BA Control before the low pressure warning whistle sounds. Should the whistle sound while the fireman is still in the building, as might happen if the work done has been particularly strenuous, he must break off and make his way back to the Control, since the air left in his cylinder will only last about a further

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ten minutes. If he fails to withdraw from the building at the proper time the BA Control Officer should initiate emergency measures.

141 The procedural rules require, among other things, that BA must be donned in fresh air; that men are to work in teams of at least two, with no man being left alone at work; that whenever a member of a team has to withdraw for any reason, ie if the withdrawal time of the team member with the shortest duration has been reached, or in the event of an accident, injury or illness affecting a team member, the whole team must withdraw; that men are not to enter a building without depositing their tallies with a BA Control Officer and on leaving they must report to the Control and collect their tallies, and that there should be a separate record for each re-entry.

142 Stage II procedure is normally initiated by the Officer-in-Charge if the situation demands more than one point of entry or where it seems likely that operations may be protracted; a Stage II Control Officer should be appointed for each entry point. All the control measures applicable to Stage I continue to apply to Stage II but with additional requirements, most significantly that at least two men should be standing by in BA for emergency all the time the Control is operating. The Stage II Control Board carries more comprehensive information, including the location of teams of BA wearers, but may be used for Stage I procedures.

143 A Main Control should also be set up when Stage II is introduced in order to coordinate arrangements for reliefs, emergency rescue and maintenance of cylinders and equipment.

144 The *Manual of Firemanship* also gives specific advice on the individual's use of BA.

> "Breathing apparatus must always be *donned and started up in fresh air*, and men standing by at a BA Control should make sure that they remain in fresh air until required. The practice of men rigging in fresh air but not putting on their face masks, or not putting in their mouth pieces, until they reach smokey atmospheres and then starting up their sets, *is extremely dangerous and must not be permitted.*
>
> "Only in most exceptional circumstances should an officer or man who has already inhaled smoke, oxygen deficient or toxic fumes, subsequently rig in BA; the reason for this is that once smoke or toxic fumes are present in the lungs and respiratory passages, it takes an appreciable time for them to be completely cleared. If closed-circuit BA particularly is donned after smoke has been inhaled, the smoke will be continually circulated and will cause irritation to the respiratory system and discomfort to the wearer. If carbon monoxide or other toxic fumes have been inhaled the continual circulation could have serious consequences....
>
> "The mouthpiece or face mask of a BA set is designed to prevent any external atmosphere from entering the respiratory system, and it is exceedingly dangerous for the mouthpiece or face mask to be removed when the wearer is in a smokey or toxic atmosphere. Once the mouthpiece or face mask is removed, smoke, carbon monoxide or other toxic gases can enter the respiratory system and the conditions described above will be created to a dangerous degree."

145 The South Yorkshire County Fire Service in common with all other fire services has paid particular attention to training in the use of BA. It is a reasonable expectation, therefore, that all the professional fire fighting employees should not only be familiar with the general principles described above but should be so schooled in the execution of the procedures that they adhere strictly to the rules as a matter of routine, regardless of the circumstances.

146 It was obvious almost from the outset that this was a fire where BA would be necessary, irrespective of chemical risks which had to be assumed, and that rapid establishment of command and allocation were essential, since in a large fire involving BA the procedures depend upon coordination of arrangements from a control point or centre in accordance with the developing needs of the fire. Communications from the control point to all parts of the fireground are important not only for the control of fire, which is not HSE's concern, but for ensuring that in the heat of the moment the fire fighters' needs for protection are identified and met. Whether control and communications were adequate in this case for the effective fighting of the fire is not our business. But, as the following paragraphs show, they fell short of providing adequate protection, a matter with which we are concerned.

147 The use of BA at the fireground can be seen as falling into three distinct phases, the first spanning the time from the attendance of the first crews at 1301 hrs to 1800 hrs on Friday 14 December when the shifts changed; the second from 1800 hrs on Friday 14 December to the shift change at 0900 hrs on Sturday 15 December, and the third period from 0900 hrs to 1800 hrs on Saturday 15 December.

148 *Phase One* In the initial stages of the attendance at the fireground the use of BA was understandably ad hoc, each crew establishing their own Stage I arrangements according to their own needs. In the first 15 minutes there was little demand for BA, since conditions in Unit 1 soon made entry impossible and conditions in the other units did not require it. A Stage I Control Board was nevertheless established by the first crews on the site in the depot yard adjacent to Units 1 and 6; a Control Board was operated in this area until approximately 0630 hrs on Saturday 15 December. Similar Stage I Boards were set up by crews deployed along the Brightside Lane front of the building, but only for short periods, since the advance of the fire through Units 2 and 3 rapidly drove the men out of the building.

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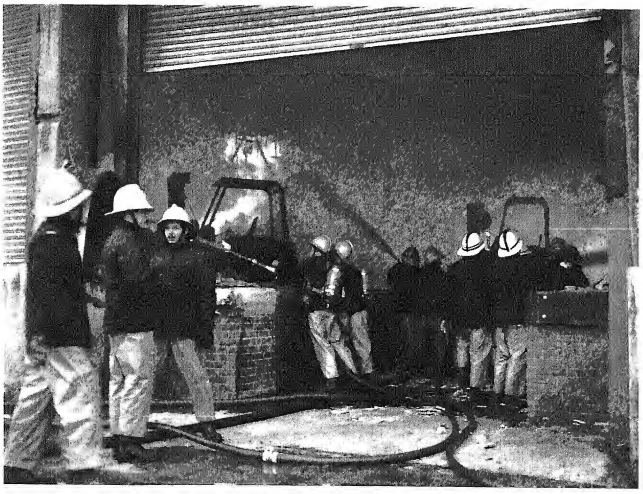
Access for jets through loading bay
South Yorkshire Constabulary



149 Once the fire was burning fiercely throughout Units 2 and 3 there was no alternative but to fight it from outside the building, through access points available within the confines of the loading bays from which jets could be directed. Video film shows clearly that, while some firemen directing jets from within one loading bay were wearing BA, the face pieces were hanging loosely in front of them. These firemen were eventually forced to withdraw from the loading bay by falling asbestos roof lining boards. Entry to the Brightside Lane side of the building was achieved later in the afternoon, without the use of BA.

150 Part-way through the afternoon a Stage I entry point was established for a short time at the south west end of Unit 5 and at least two entries were made by one crew at this point. BA was used intermittently during the course of the afternoon, but at the discretion of the officers in charge of the individual areas despite the arrival of the Control Unit, from which an officer should have been designated to take overall command of the use of BA as a Main Control.

151 The greatest demand for the use of BA was in the depot yard adjacent to Units 1 and 6 where conditions deteriorated very quickly as a vortex in the lee of the building forced smoke from the escaping plume downwards to ground level. Where operational procedures were followed they were restricted to Stage I level throughout the afternoon.

152 *We note that* there were extensive departures from the established procedures for ensuring the safety of those wearing BA. While some minor variations from procedures might have been understandable in the circumstances, the number and nature of the departures noted must be regarded as serious. These included failure to establish and maintain proper direction and control to ensure that BA was used whenever necessary, that firemen wearing BA actually used it, and that the relevant control system was operated, in such a way that the location of BA teams was known and could be controlled. Stage I procedures continued to be applied after the time when it would have been appropriate to initiate Stage II. The location of all BA control points had not been properly planned and at least one became smoke logged to the extent that the Control Officer himself had to wear BA. No proper arrangements were made for relief nor for emergency rescue; nor were the arrangements for BA maintenance and cylinder filling adequate - some depleted and used equipment was replaced on pumping appliances after use or even left inside the building.

153 *Phase Two* At 1830 hrs the Stage I Control Board in the depot yard was taken over by the new watch who continued to work from this point under Stage I entry conditions for most of the night.

154 At approximately 1900 hrs the Chief Fire Officer briefed newly-arrived officers about the plan of attack which included a progressive entry into the building using BA. However some officers who had arrived early missed this briefing. Stage II was introduced and BA Main Control established at approximately 2000 hrs on the Brightside Lane side of the building, in the charge of a Station Officer who was coordinating three Stage II control points - one at the Brightside Lane side of Unit 3, one at the south west (Sheffield) end of Unit 5 and one on the north west elevation (the railway side) of Unit 5. The Stage I Control Board in the depot yard at the north eastern end of the transit shed remained in use throughout this phase.

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155 The BA Main Control exercised effective procedural control over the three Stage II entry points known to the Main Control Officer until the Main Control was closed down at 0100 hrs on Saturday 15 December. The Stage II entry point at the south western end of Unit 5 closed down at approximately 2245 hrs on Friday night. After the BA Main Control had closed down, BA entry was still being made to Unit 5 from the depot yard at the north eastern end and recommenced at the south west (Sheffield) end. Both entry points were being used under Stage I procedure. The south west entry point was in operation until approximately 0415 hrs and the north eastern entry point until approximately 0630 hrs.

156 *We also note* that serious departures from set procedures continued during this phase of the fire fighting operations, the most important again relating to control of BA. The BA Main Control was unaware of a continuing Stage I entry. This entry point was in use and a further Stage I entry established after the Main Control under Stage II had been withdrawn. Senior staff appeared to be aware of this.

157 *Phase Three* Different operational considerations now applied. The Brigade watches had changed so that many of the crews arriving at around 0900 hrs on Saturday were seeing the site for the first time, having missed the drama in which their colleagues had participated a few hours earlier. The fire, although not totally extinguished, had subsided, due partly to the efforts of the fire fighting crews the previous night and partly to the exhaustion of its fuel. Deep-seated pockets of fire still had to be extinguished but the smouldering remains did not present any off-site problems. Firemen were able to gain access among the debris with their cooling jets and there was no longer the pressing urgency of the previous day.

158 A significant number of those who reported symptoms of ill health subsequently were among the firemen attending the site for their first time on the Saturday. There was no indication from the firemen interviewed by the HSE investigating team that BA was used during the morning. A BA Main Control with two Stage II entry points was established at approximately 1330 hrs that day.

159 Working conditions varied considerably across the site and officers in charge of individual crews had to judge whether BA should be used to avoid discomfort or possible injury. A crew in one area worked at damping down for more than one and a half hours without BA during which time they were periodically enveloped in thick smoke. The crew variously described the conditions as anything from "absolutely terrible" to "uncomfortable, but we've been in a lot worse". During periods of discomfort the firemen retreated to fresh air for a few minutes. All firemen involved in this incident reported symptoms of ill health in varying degrees of severity.

160 The officer in charge of this crew did not order complete withdrawal. Eventually he left the building to seek BA but failed to find any, including the two unused sets on his own appliance parked in Brightside Lane. The officer returned to his crew and continued working without BA. He did not seek help from the Control Unit.

161 All crews were withdrawn shortly after midday when a question was raised about possible storage of isocyanates. This was later disproved but during the break the Divisional Commander, the Officer-in-Charge at the time, took advantage of an offer from EHOs on site to test the atmosphere in the building. Although the tests revealed no significant hazard it was thought prudent to issue an instruction to avoid two areas in Unit 5 where drums of anthraquinone disulphonic acid salts and the fluorides were stored. It was also decided by the Divisional Commander that all further work was to be done in BA.

162 Circumstances during this period of fireground activity illustrate the difficulty in making judgements about the need to use BA and how this may depend on the past experience and attitudes of those in charge. No urgency was attached to the work being undertaken at the time and officers could readily have withdrawn themselves and their crews if atmospheric conditions became unfavourable and BA was not available. Nothing emerged from HSE enquiries to suggest that any officer would have been criticised for withdrawing his men, a step which might have reduced the number of those eventually found to have been affected. The damping down operations continued for the remainder of Phase Three, entries being made under appropriate Stage II conditions, until BA was discontinued at 1800 hrs.

163 *We further note* that during the first half-day of this phase of the fireground activity BA was not used in situations where it clearly would have been appropriate.

164 *Maintenance* Under normal circumstances servicing a BA set involves cleaning and sterilising the face piece and replacing the cylinder with one which is fully charged - a relatively simple and speedy operation. A supply of fully charged cylinders needs to be available. The demands on the air compressors described at paragraph 137 had never been as great as during the Brightside Lane fire. The presence of unidentified "chemicals" on the site and the release of charred asbestos felt particles combined to give rise to a fear of contamination and this generated sufficient confusion to cause delay in servicing BA sets.

165 The Duty Officer in charge of the Control Unit should have designated an officer to be responsible for the servicing of the BA which had been widely used on the site from the outset. At about 1715 hrs, when the available sets and spare cylinders in the immediate area of the depot yard at the north east end of the building became exhausted, the Control Unit despatched a van to collect all the available BA sets on the fireground into one place. Not until that time were arrangements put in

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hand to establish a servicing area in the adjacent yard. By 1830 hrs, 15 fully operational sets had been collected as well as numerous full spare cylinders and eight sets needing to be serviced. During the 1800 hrs shift change-over additional sets arrived for servicing, bringing the total to about 20. Although the servicing area was established before the shift change, the cleaning and servicing equipment was not delivered until about 1930 hrs.

166 Servicing was being carried out in the open air, although there was an underground car park nearby which would have provided protective cover against any smoke or fallout of asbestos.

167 No officer was spcifically designated to coordinate and oversee the collection, servicing and distribution of the BA sets.

Medical

168 The assistance of EMAS was requested to determine whether the symptoms reported to have been experienced by firemen were due to exposure to smoke at Brightside Lane, and establish any evidence to suggest short or long-term damage to their health. The possible effect of exposure to smoke and fumes at fire fighting operations after the Brightside Lane fire could not be discounted, but the duration of the major incident would certainly have predominated. EMAS was also asked to consider the medical treatment and health surveillance of firemen in the South Yorkshire County Fire Service.

169 *Ill health of firemen* Some delay was experienced in obtaining from the FBU a full list of affected firemen for submission to EMAS. Arrangements had immediately been put in hand by the local Employment Medical Adviser (EMA) to collect appropriate background information from consultants who had been involved in examining the 11 firemen whose names were available. In the absence of further information from the FBU, HSE requested from the Fire Service itself names of further firemen who had reported symptoms of ill-health. The responses to the resulting Fire Brigade Weekly Order produced a list of 40 names, including some of the original 11 supplied by the FBU, of men who had experienced symptoms with varying degrees of severity. Forty-one firemen were seen in the course of the EMAS investigation, which was aided by the cooperation of the Deputy Chief Medical Officer of the National Coal Board, whose local facilities and expertise were used for the clinical examinations.

170 Medical information was obtained from local consultant chest physicians who had seen firemen following referral by their general practitioners. Additional reports and records were obtained from local hospital accident and emergency departments concerning men who had attended for investigation. The Fire Service's Medical Adviser (FSMA) had no medical records to contribute to the enquiry. A detailed occupational and medical history, including smoking habits, was obtained from each fireman, followed by a full clinical examination. An x-ray and respiratory function test were carried out on each man and his present state of health ascertained. These factors would have been influential in an individual response to exposure to smoke and fumes.

171 For the purposes of the investigation three categories were adopted to allow simplicity of reporting, although in several instances clinical details of the individual cases were more complex. The following classifications therefore give general guidance only.

Category A - symptoms and signs consistent with exposure to a complex mixture of smoke and chemical fume.

Category B - symptoms of irritation of eyes, upper respiratory tract or skin attributed to exposure to chemical mist and/or fume, but with no obvious chest symptoms.

Category C - no definite clinical evidence to link symptoms with exposure to smoke and fume.

172 The number of men seen in each category were as follows:

Category A - 27
Category B - 11
Category C - 3

173 In Category A there were symptoms and definite clinical evidence to indicate damage to the upper respiratory tract and bronchi in the majority of cases seen, although these varied in severity. Twenty four men were off sick at some stage following the fire and three had symptoms which lasted for more than four months. These three have been followed up as outpatients at the local hospital.

174 The main symptoms affecting men falling within Category B were sore throats and skin rashes which were consistent with exposure to an irritant contaminant in the atmosphere. One fireman seen had a rash on his neck some four months after the incident.

175 The medical history, clinical examination, x-rays and pulmonary function tests showed that although an immediate effect on health had been demonstrated for those in Categories A and B, there was no evidence to suggest the development of long-term chest disease. The findings were consistent with current medical literature relating to smoke inhalation and surveillance of firemen (see Bibliography).

176 *Medical treatment and health surveillance of firemen.* In 1970 the Home Departments issued guidance following recommendations, endorsed by the Secretary of State, made by a committee appointed to review the medical standards for fire services. No routine medical surveillance was recommended although it was proposed that each fire service should have the advice of a medical officer who understood its needs and who was

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known and accessible to the men. It was also recommended that all firemen currently joining the Fire Service have a pre-employment medical examination, no further medical assessment being required until they reached the age of 40 except in the case of those men applying for the heavy goods vehicle driving licence required for the Fire Service's major fire fighting appliances. From the age of 40 the firemen should be medically examined every three years.

177 Arrangements in South Yorkshire followed the Home Departments' guidance on medical examinations. The EMA reported that basic pre-employment medical records were maintained by the FSMA but that nothing to indicate exposure to smoke or fume was shown routinely on the medical records. More significantly no radiology or spirometry was carried out on new entrants to establish base-line records.

178 While there were some severe short term effects, there were few lasting symptoms, and the South Yorkshire County Fire Service had generally followed the Home Departments' guidance dealing with toxic hazards and the medical treatment of firemen, which recommends that firemen overcome by smoke at a fireground should be taken as soon as possible to the nearest casualty unit; men who develop symptoms some time after exposure to the smoke should report this to management who would consult the FSMA before issuing a card (Fire Service No FS134) to indicate the substances to which the firemen could have been exposed. The information on the card is for the guidance of general practitioners or hospital accident and emergency departments.

179 Some firemen interviewed were unaware of the procedure for issuing the information card.

180 Following the Brightside Lane incident many of the men reported to their general practitioners independently, in accordance with the normal procedure, which resulted in many men being referred to different specialists and consultants. Such a system dilutes the information available to the FSMA and can frustrate follow-up.

181 No routine periodic medical surveillance was carried out on firemen engaged in fire fighting operations and no information was available in the medical records on current smoking habits or additional part-time occupations. Except for men over 40 and the HGV drivers, the FSMA only saw firemen at the specific request of management, usually following prolonged sickness absence or at the request of men seeking early retirement on health grounds. The FSMA was not available to the men except via management. There was no routine recall system for men known to have chest diseases or men known to have been exposed to high levels of smoke during fire fighting operations.

182 These arrangements did not appear to satisfy the purpose of the Home Departments' recommendation: there were no routine procedures whereby the FSMA could offer or the Fire Service request medical advice except in individual cases. The FSMA, a retired general practitioner, was currently employed on a part-time basis. In the Fire Service Headquarters he had one small room containing a filing cabinet of records, a couch and little else. He had no additional staff to help him. He was not a member of the Fire Service's Health and Safety Committee, nor had he asked to be a member or attend any meetings to raise matters of medical concern.

183 In the course of his investigation the EMA compared the standard of medical surveillance of firemen in South Yorkshire with that advocated in the HSE Guidance Note *Health Surveillance by Routine Procedures* and reported that it did not accord with the recommendations in the Guidance Note in the following respects:

(a) provision of adequate facilities, accommodation and equipment for the use of the FSMA;

(b) frequency of medical assessments, despite periodic exposure to toxic substances;

(c) adequacy of medical records including details of sickness absence and names of toxic substances encountered at work, and

(d) additional use of medical tests (respiratory function tests and radiology).

184 Additionally it was suggested that consideration should be given to the recommendations below.

(a) Routinely notifying the FSMA of men exposed to significant levels of smoke and fume so that a recall system could be introduced.

(b) Introducing regular medical sessions to replace the present haphazard system.

(c) Making on call and locum arrangements to provide cover when the FSMA was unavailable.

(d) Having the FSMA attend meetings of the Health and Safety Committee when matters of medical interest were to be discussed.

(e) Arranging for firemen seen during the investigation to be followed up to identify any evidence to suggest a long term effect on health following the Brightside Lane incident. Responsibility for this follow-up and subsequent examinations should remain with the South Yorkshire County Fire Service.

185 Further guidance on these matters was available from EMAS and information on the establishment of an occupational health service and the role of an occupational physician was contained in the HSE publication, *Guidelines for Occupational Health Services.*

Environmental problems

Effects on members of the public

186 At about 1530 hrs the Police asked EHOs to make an assessment of the likely risk to the public and to decide whether evacuation of residents should be

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considered. The EHOs alerted the relevant departments within the local authority before attending a conference on the fireground with the Police and the Chief Fire Officer at which the criteria for considering evacuation were discussed. Two EHOs then left the site to track the smoke plume and see whether it was descending. The plume was tracked as far as Parkgate and Rawmarsh in Rotherham. It was still maintaining height, and was beginning to disperse. Air monitoring was carried out, with negative results. No odour was noted. As darkness fell it became impossible to track the plume any further. The wind change forecast by the Meteorological Office did not develop until later in the night and the EHOs judged that evacuation was not necessary. As a precautionary measure air monitoring for toxic gases was carried out throughout the night to the north and east of the site, particularly in the Wincobank and Brightside areas. All results were negative. The EHOs reported that the smoke had abated considerably by 0200 hrs on Saturday 15 when mainly water vapour was coming from the site.

187 While their colleagues were tracking the smoke plume, the Sheffield EHOs remaining on site had been informed of the fallout of materials — the charred bitumen/asbestos felt from the roof sheets — downwind of the site. At about the same time their opposite numbers in Rotherham were carrying out tests on the fallout material at a school in Kimberworth, after the headmaster had reported that charred paper was falling on his school field. The Rotherham EHOs used their mobile laboratory to establish that the fallout material contained asbestos and justified immediate removal by a specialist firm. They then visited the fireground and consulted with the Sheffield officers to coordinate their respective activities. Air sampling for asbestos was carried out off-site by the Rotherham officers while the Sheffield EHOs confined their asbestos sampling to the fireground itself.

188 The Rotherham EHOs contacted two local radio stations to inform the public of the problem and to invite telephoned information from 0900 on the Saturday. As a result it was established that fallout had occurred over a mile wide corridor the length of the Borough of Rotherham, including the Kimberworth, Greasbrough, Rawmarsh, Swinton and Wath areas (see Figure 9).

189 Weather conditions overnight had been damp and it rained on Saturday morning. Inspection of the corridor revealed widespread contamination by material which looked like charred paper or card up to 25 cm by 15 cm in size. All the material on the ground was wet.

190 The Rotherham EHOs consulted their relevant departmental directors and a clean-up operation was initiated on the Saturday afternoon, using Local Authority employees. As a precautionary measure 37 schools in the area were closed until they had been cleared of the fallout material. It was concluded that, since the material was wet, asbestos fibres were unlikely to become airborne during the collection of the fragments and respiratory protection equipment was not necessary. In order to encourage people to treat the material with care, they were advised to wear rubber gloves when collecting the material: they were also advised to place it in plastic bags which should be sealed to await disposal.

191 The report of the Rotherham EHOs emphasises that at no time was there any danger to the public health from this incident. Their judgement was based on their Scientific Officer's report of his analysis of the air samples and smear slides taken from several schools and on their conclusion that the fallout material, kept wet by the rain and snow falling over the weekend, could be handled safely without respiratory protection. This was supported by simple experiments carried out subsequently by HSE which recorded significant fibre release only from dry material.

192 The on-site monitoring for airborne asbestos fibres carried out by the Sheffield EHOs gave similarly reassuring results. All the samples submitted for analysis showed less than 0.01 fibres/ml, the lowest effective detection level. The Sheffield EHOs therefore concluded that residual asbestos-containing material on-site would not cause any significant off-site pollution hazard.

193 As part of a national survey of smoke and sulphur dioxide in the general atmosphere Sheffield Environmental Health Department run two sites for the Warren Spring Laboratory of the Department of Trade and Industry. Daily readings are recorded of concentrations at the two sampling points, one of which was situated just south of the path of the smoke plume. The second sampling point was a considerable distance to the north. Although some rise in sulphur dioxide concentrations was recorded at the nearer sampling point on 15 December, the result was reported to be within the normal range of variation. No rise in smoke concentrations was recorded.

194 As a precautionary measure the Sheffield EHOs alerted the Yorkshire Water Authority at the Blackburn Meadows Sewage Treatment Works and the sewerage section of the Sheffield Works Department of the possibility of toxic materials being carried to the works by the volume of water running off the Brightside Lane fire site.

195 Collection of the charred asbestos material was carried out immediately following the fire by employees of the two local authorities involved. The Sheffield EHOs estimated that some 500 kg of material was collected in their area; the Rotherham EHOs expressed their estimate as "at most a dustbin full". It was not possible to calculate the total amount of asbestos material discharged from the site in the smoke plume since there were too many unknown factors. The research project in hand is expected to provide more detailed information about the behaviour of asbestos materials when subject to fires in buildings.

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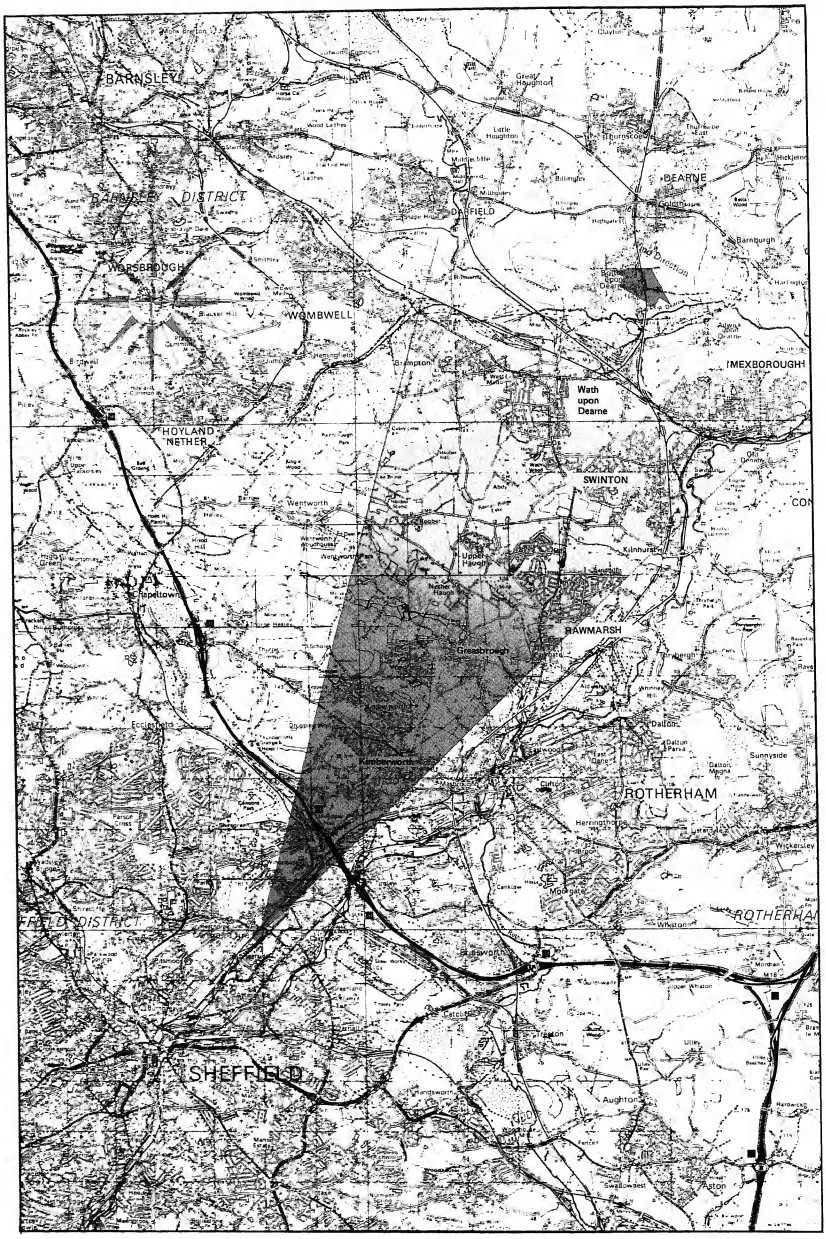

Fig 9 Area affected by fallout material

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196 In view of the reports of symptoms of ill health experienced by Local Authority Officers and Police attending the site, in addition to reports of an increased level of ill health among members of the public living near the site, EMAS was asked to carry out a medical investigation, to determine whether there was any evidence of an immediate or long-term health risk to the community.

197 The EMA confirmed that current medical knowledge suggested that brief exposure to levels of asbestos fibre below 0.2 fibres/cm^3 was insignificant.

198 In considering community health, the EMA took into account the wintry conditions prevailing during and after the fire. He interviewed three general practitioners practising in the Wincobank and Brightside areas of the city in an attempt to ascertain whether any patients attending surgery had been affected by the fire. In addition community medicine specialists for Sheffield and Rotherham were interviewed.

199 Two of the general practitioners stated that the numbers attending their surgeries were the same as in previous years and that there had been no noticeable increase in the number of chest complaints or skin rashes. One general practitioner, however, said that for several weeks after the fire he had seen approximately three patients additional to the normal numbers attending his surgery for several weeks after the fire; in his opinion the symptoms of sore throats and chestiness could be attributed to exposure to smoke and fume. He also pointed out that the worst affected patients had acknowledged that they had stood and watched the fire fighting operations. The community physicians stated that they had received no reports of increased numbers attending practices in the fallout area which would have suggested an adverse effect on the community's health.

200 The EMA emphasised that the fire took place at the time of year when the number of chest complaints and sore throats was customarily high. Although it was recognised that those who already had chest diseases would be susceptible to smoke, there was nothing to suggest that this had occurred following the incident.

201 The EMA concluded that the long term health risks to the community were negligible.

202 Of the 153 police officers attending the fire over several days the EMA reported that 52 complained of symptoms — sore throat, dry skin, mouth ulcers, chesty cough, cold sores and headaches. Three were absent from duty following the fire, one for one day, one for three days and one for two weeks. It was not possible to indicate whether the men were off as a result of exposure to the smoke or whether there was an associated viral infection. All the police officers had recovered fully and were suffering no further ill effects after the fire.

203 The Local Authority Principal Building Surveyor who had attended the site had experienced an intermittent skin complaint after the incident, but the symptoms had ceased when he was seen by the EMA.

Conclusions and recommendations

Cause and origin of the fire

204 The fire started in an unattended warehouseman's cabin inside Pickford's furniture repository and probably arose from the use of an old fireclay panel heater. The electricity installation supplying the cabin did not satisfy the requirements of the Electricity Regulations. If Pickfords had notified HSE of their occupation of the premises an inspector would have visited before the fire. Periodic examination by management to ensure that appropriate safety standards were achieved would have identified long-standing hazards and enabled them to be dealt with.

205 *We recommend* NFC to ensure that its member companies are aware of current legislation applying to their occupation of its premises and make effective arrangements to monitor their performance in the light of such legislation.

Delay in detection

206 The initial outbreak of fire was undetected until it had such a hold that considerable damage and loss was inevitable. The provision of automatic fire or smoke detection equipment could have alerted staff earlier and, if linked to a fire station, could have enabled the fire fighters to deal more successfully with the fire in its initial stages.

207 *We recommend* those responsible for large buildings, particularly those which are unoccupied or only occupied in part or for short periods and in which a fire might remain undetected until it has a firm hold, to review the need for automatic fire detection equipment, possibly linked directly to a fire station. Advice should also be taken on the benefits of installing a sprinkler system to detect and control a fire at its origin.

Rapid spread of fire

208 This incident illustrated how easily fire, once having secured a hold, can spread in an open plan building. It demonstrated the ineffectiveness of dividing partitions which were not fire resisting and were not properly joined to or built through the external roof.

209 Clearly, the risk of fire spreading exists in other similar open plan structures. *We recommend* owners and occupiers of such buildings to make existing partitions effectively fire resisting and to consider constructing fire resisting divisions to reduce the risk.

210 The spread of fire was undoubtedly facilitated by the undivided air space between the fire resisting underdrawing and the roof sheeting. The key factor, however, was probably the build-up of hot gases in the

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roof, which would have contributed to the spread of fire by radiating heat and accelerating the combustion of material stored below. The burning rate of the roofing material, normally fairly slow at ambient temperatures, would have been similarly accelerated. Effective venting of the fire through the roof would have reduced the speed and extent of its spread through the space above the underdrawing. The provision of divisions in the roof space would also have reduced the ease with which fire spread under the roof.

211 *We recommend* that adequate fire vents be installed in such buildings and roof partitions be fitted where fire resisting compartmentation is not practicable. *We also recommend* that the test procedures in British Standard 476 for the performance of roofing and ceiling materials in fire be reviewed in the light of the evidence from the Brightside Lane fire.

212 We understand that the Building Regulations are framed to protect people rather than property, but note that some features such as speed of fire spread and access for fire services etc must influence the risk to which firemen may be exposed when fighting fire. We have been informed that the Department of the Environment is currently carrying out a review of the Building Regulations and will soon be considering the technical content of the Regulations and supporting guidance. Accordingly, *we recommend* the Department of the Environment to consider in the course of their review whether further attention could be given to those matters which might affect the safety of firemen such as setting limits for the size of compartments in single storey buildings, requiring partitions to be made fire resisting or requiring the provision of fire vents in roofs, and whether guidance should be issued on these matters.

Information for fire services

213 The contents of the building contributed not only to the fire but also to the problems facing those fighting it. The hazardous materials could not be readily identified by the Fire Service. If the occupier had kept such materials suitably segregated, in a protected fire compartment, the Fire Service would have been spared the apprehension and uncertainty evident during the fire fighting operation. Better information could have been available if locations of goods had been kept on a site plan. Moreover, the availability of the private water supplies for fire fighting had not been regularly checked.

214 *We recommend* users of such buildings to ensure that they obtain appropriate information about the potential hazards associated with the materials they are storing; materials which are particularly toxic or corrosive, highly flammable or potentially explosive, should be suitably stored in a dedicated fire compartment. Arrangements should also be made for relevant information to be readily available to emergency services and for private fire fighting water supplies to be regularly and competently checked by owners.

215 Information provided to the Fire Service by an occupier at the time of a fire needs to be supplemented wherever possible by information routinely collected by the periodic inspections made by the Fire Service. The information noted on the South Yorkshire County Fire Service records was nearly six years old and did not reveal the inadequacy of the water supply; this was also unknown to the occupier who had not made recent checks. The South Yorkshire County Fire Service might wish to consider whether higher priority should be given to inspection of premises for which information is substantially out of date, even if risk to life is small.

Safety of firemen

216 The investigation of the activities on the fireground revealed features which might have affected the efficiency and effectiveness of the fire fighting operations — these are not the concern of HSE; they have been brought to the notice of the Chief Fire Officer and will also be of interest to the Home Departments. However, there were features of the operations which resulted in firemen being exposed to unnecessary risk; the *Manual of Firemanship* is a clear statement of what is considered by the relevant authority to be reasonably practicable. The actual operation as described in paragraphs 48 to 70 fell short of the advice in the Manual, crucially, in respect of control and communications on the fireground and, in particular, of the management of BA.

217 The fire was unique in the experience of most of the fire fighters attending the fireground: the number of appliances, the scale and duration of the operation were greatly in excess of anything tackled previously, although it is by no means rare for a fire of such magnitude to occur nationally. Lack of experience locally of such a fire might have contributed to the identified failures to carry out designated fireground tasks in accordance with set procedure although training and practice should have avoided such failures. It could also explain why, despite exemplary provision of equipment, there were widespread departures from established procedures for the use and maintenance of BA. We would expect the local Fire Service to learn from the experience and ensure that improvements are made. The Home Departments and particularly HM Chief Inspectors of Fire Services will wish to consider whether issues raised in this report and the lessons of this fire are applicable more widely in the Fire Services.

Health of firemen

218 Firemen might reasonably be expected to cope with some short-term exposure to smoke without undue adverse effect, but it was clear from the outset that this fire fighting operation would be a long one. Consequently extra care should have been devoted to the use of breathing apparatus and the potential effects on the health of those involved. The health of the majority of the firemen examined through EMAS had been affected, in varying degrees of severity, by exposure to smoke and fume in the course of the fire

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fighting operation. The standard of immediate treatment of firemen suffering ill health after fireground experience generally followed the guidelines issued to fire authorities by the Home Departments: the general health surveillance also complied with the current Home Departments' recommended standards, but not those recommended by HSE for employment generally. The FSMA was not readily accessible to firemen, nor in practice was he able to serve effectively as an adviser to the Fire Service on medical matters.

219 We suggest therefore that the Home Departments consider with EMAS how their recommendations might be brought into line with HSE guidance and whether the specific local advice from the EMA in Sheffield should be applied more generally. Meanwhile the South Yorkshire County Fire Authority and its medical adviser should together improve the effectiveness of the arrangements for providing medical advice.

Risk to the community

220 Subject to any revision resulting from the research work being undertaken, the evidence indicates that although immediate physical effects were felt for a time after the fire there was no perceived significant long-term risk to the health of the community from the asbestos fallout material or from the smoke plume.

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Appendix 1 Contents of building

Details of goods stored

Unit 1

See paragraph 26 and Appendix 2

Unit 2

Thirteen companies owned the goods stored by NCL in Unit 2, which included:

Large quantities of collapsed cardboard cartons stacked on pallets stored three high and three deep in five areas.

Large quantities of consumable goods stored in cardboard boxes on pallets in four areas. These goods included jars and tins of fish and meat paste, margarine, sweetcorn, ground rice, flour, coffee, Christmas puddings, jars of beetroot, tins of fruit cocktail, wheat and meat pies.

Large quantities of electrical equipment stored in cardboard boxes on pallets in two areas in addition to street lighting furniture and several tons of PVC-covered aluminium cable, air conditioning units and refrigerators (without refrigerant).

Quantities of timber and plastic curtain poles stacked on pallets three high in three areas.

Quantities of nickel blocks in drums (in security cage) and nickel nails stored in cardboard boxes on pallets three high.

Large quantities of polypropylene granules stored in bags on pallets three high covering about half the central floor area.

Unit 3

Again a number of customers owned the goods stored in this Unit, which included:

Large quantities of plastic water containers stored in boxes stacked on pallets.

Large quantities of metals stored on pallets in two areas and in loose blocks in one area.

Large quantities of toilet rolls, bleach, washing powder, washing-up liquid and baked beans stored in cardboard boxes on pallets over the central area.

Large quantity of cardboard and wood advertising display materials stacked on pallets.

Large stock of loose hardwood timber.

Quantity of pumice stockpiled on the floor.

Small quantity of bar fittings and coolers in two areas.

Large quantities of bottles of wines in cardboard boxes stacked on pallets in three areas.

Unit 4

Large quantities of toilet rolls, disposable nappies, confectionery and miscellaneous combustible articles, all of which were stored in cardboard cartons on pallets stacked three high.

Unit 5

On the raised platform area:

Quantities of motor vehicle components.

Towels and bedding (in security cage).

Electrical equipment (in security cage).

Approximately 12 x 30 kg plastic drums of water treatment chemicals.

Approximately 100 x 5 litre tins of 5-10% formaldehyde solution.

Approximately 20 x 50 kg sacks of sodium nitrate*.

Several large empty wooden cable drums.

Plastic, cardboard and polystyrene display materials.

Bales of (empty) plastic sacks.

Small quantity of loose timber.

Approximately 30 "Holbins" - large cardboard cylindrical containers into which polypropylene granules were loaded mechanically from opened sacks.

Along the central floor area:

Large quantities of polypropylene granules in sacks on pallets.

5 full acetylene cylinders.

Large quantities of metal radiators on pallets, wrapped in plastic.

10 large aluminium containers used for bulk transport of polypropylene granules.

Approximately 50 Holbins

Approximately 50 pressurised tanks containing fruit juice concentrate.

Quantities of tinned fruit in cardboard cartons.

Along the wall dividing the transit shed from the warehouse:

Coils of steel wire.

Animal feedstuff additive.

Steel bars.

Rubber and PVC conveyor belting in large rolls.

Various refractory materials, stored loose, together with a large number of empty steel drums labelled "aluminium chloride"* .

Large number of steel drums containing fine graphite rods.

Large stacks of furnace electrodes.

60 x 45 gallon steel drums (with sealed lids) containing anthraquinone disulphonic acid salts.

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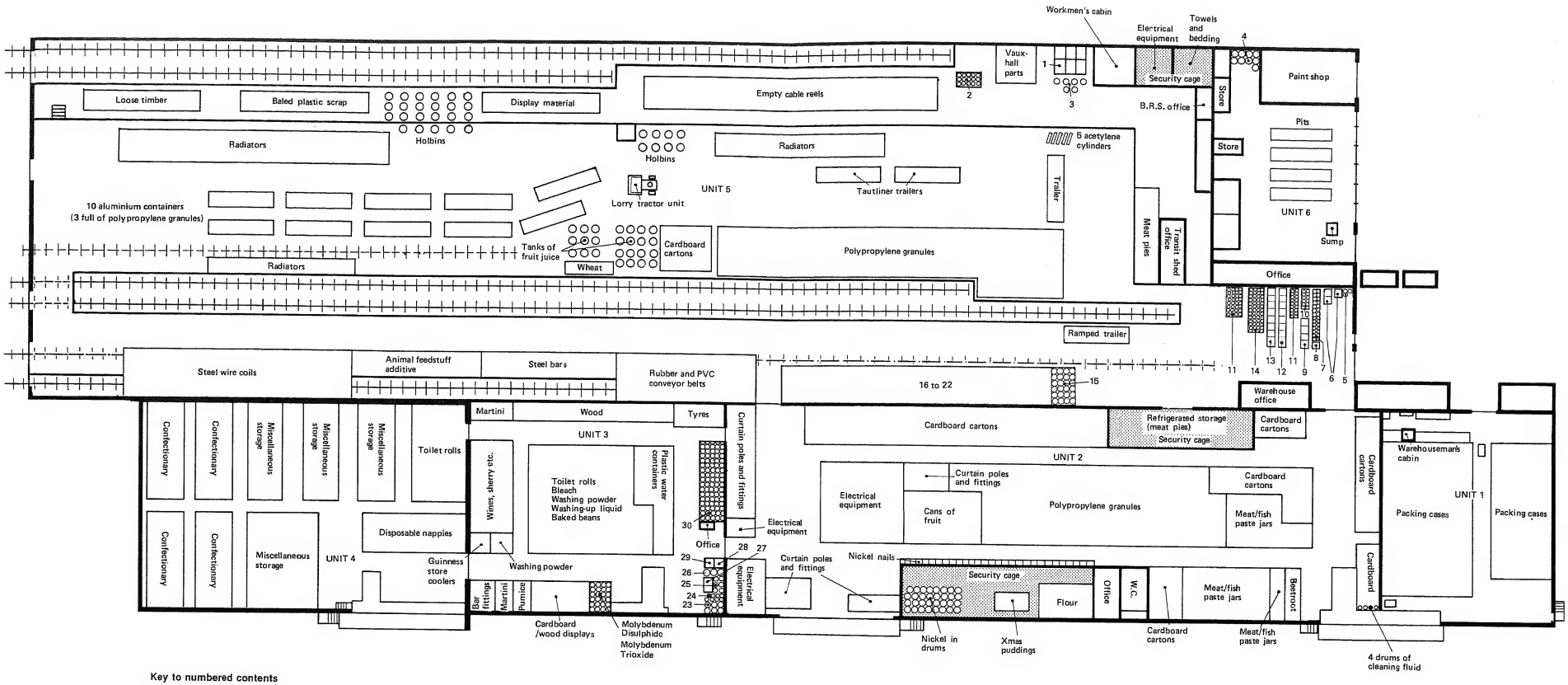

Key to numbered contents

1	Sodium nitrate*	16	Furnace binder
2	Formaldehyde solution	17	Graphite rods in sealed steel drums
3	Water treatment chemicals	18	Furnace electrodes
4	Ethylene glycol antifreeze solution	19	Silicon crystals
5	Oil drums	20	Castings — loose and in drums
6	Potassium fluoride*	21	Assorted binders and sands
7	Sodium bifluoride*	22	Empty drums labelled "Aluminium chloride"*
8	Polyethylene granules	23	Nickel in drums
9	Potassium fluoroborate	24	Nickel in small drums
10	Barium fluoride*	25	Molybdenum oxide in small drums
11	Potassium bifluoride*	26	Molybdenum sulphide in large drums
12	Polyethylene granules	27	Ferromolybdenum alloy
13	Sodium nitrite*	28	Nickel nuggets — loose
14	Ammonium bifluoride*	29	Soap powder
15	Anthraquinone disulphonic acid salts	30	Nickel in drums

* Now listed as dangerous substances under the Classification, Packaging and Labelling of Dangerous Substances Regulations 1984.

Layout of contents

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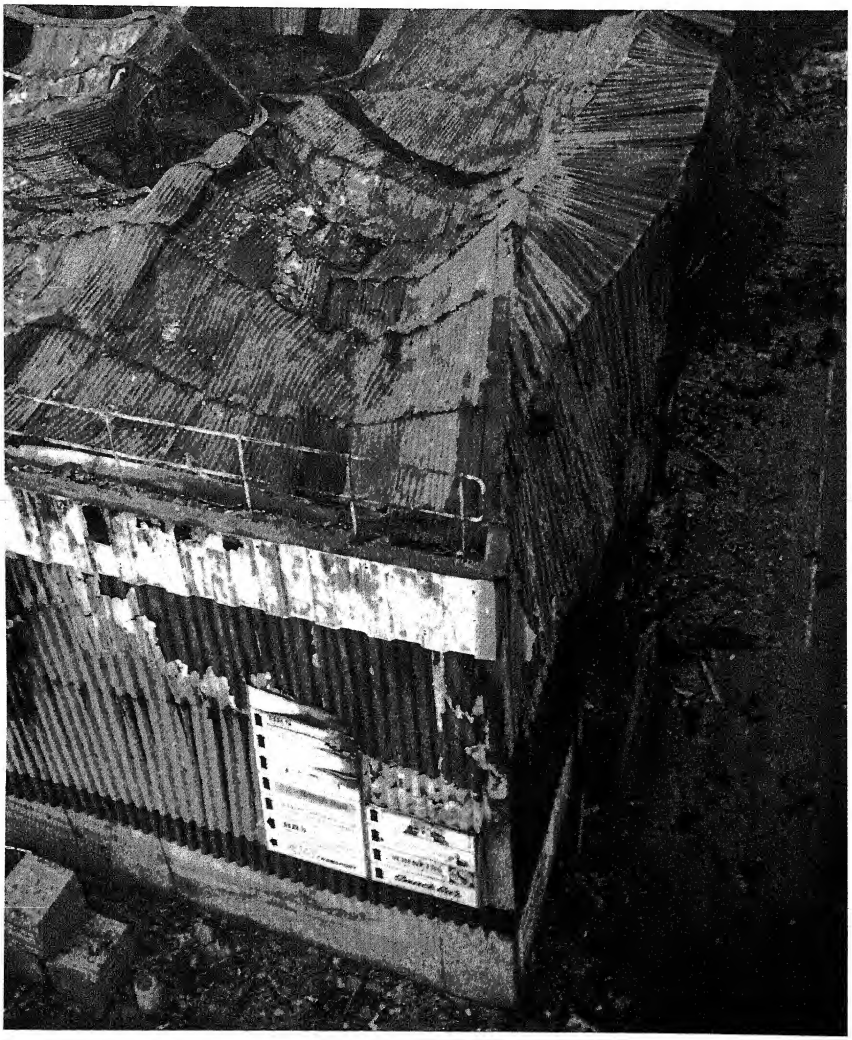
Along the wall dividing the transit shed from Unit 6:

3 large oil drums.
Approximately 18 tonnes of polyethylene granules in sacks on pallets.
Approximately 70 tonnes of chemicals, including potassium bifluoride*, sodium bifluoride*, barium fluoride*, potassium fluoroborate, sodium nitrite*, ammonium bifluoride* and potassium fluoride*, all stored either in paper sacks or in cardboard drums lined with polythene.

* Now listed as dangerous substances under the Classification, Packaging and Labelling of Dangerous Substances Regulations 1984.

Unit 6

10 large drums of ethylene glycol antifreeze solution.



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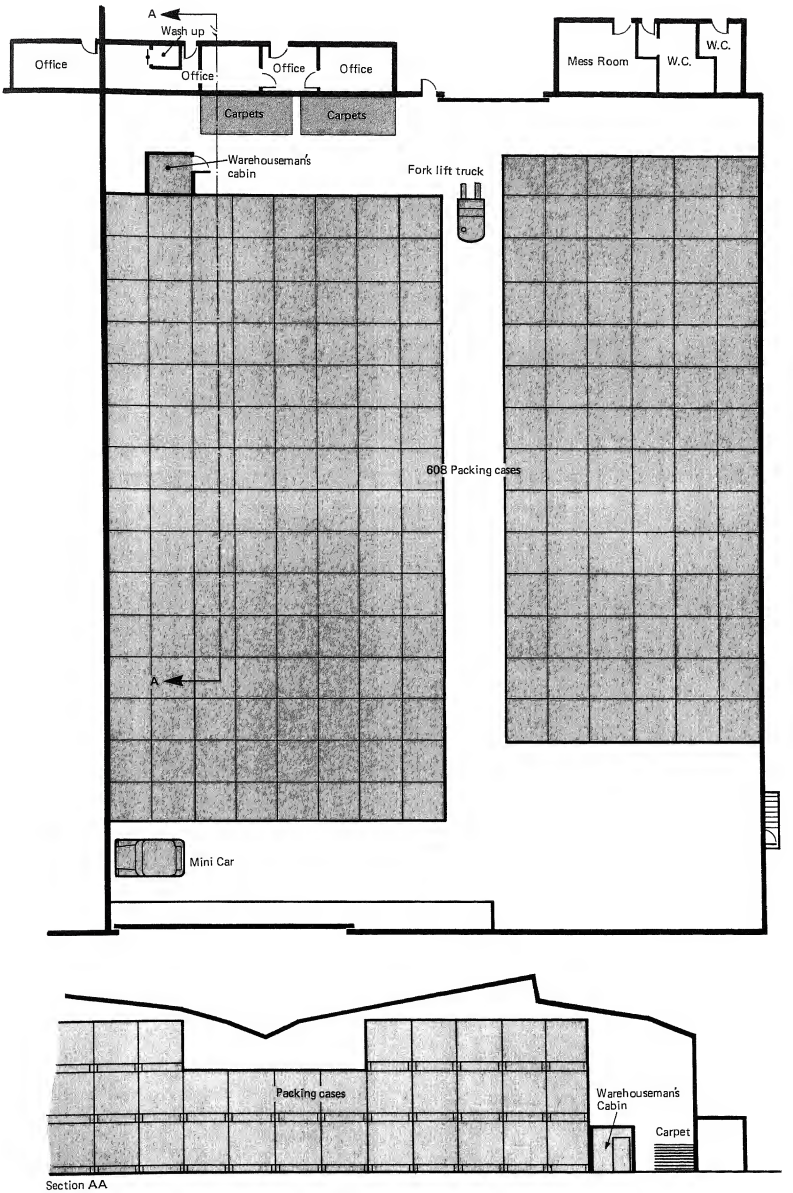
Appendix 2 Pickfords Removals Ltd



General layout of Unit 1

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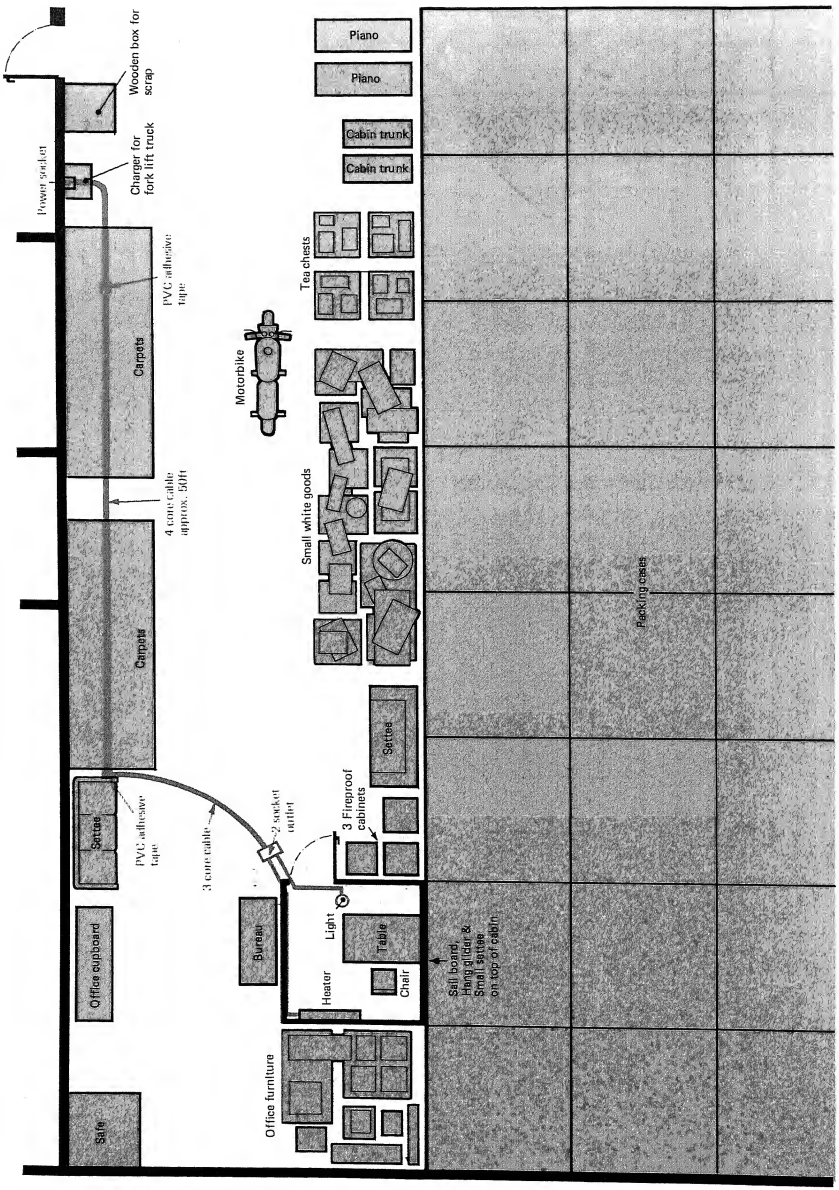

Detailed layout of north west side of Unit 1

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